Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

52 n

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF BIOLOGICAL SURVEY
HENRY W. HENSHAW, *Chief*

NORTH AMERICAN FAUNA

No. 39

[Actual date of publication, November 15, 1915]

REVISION OF THE POCKET GOPHERS OF THE GENUS THOMOMYS

BY

VERNON BAILEY

CHIEF FIELD NATURALIST, BIOLOGICAL SURVEY

LIBRARY
RECEIVED
NOV 5 1915
U.S. Department of Agriculture

WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

B79M

PRAIRIE POCKET GOPHER (THOMOMYS TALPOIDES RUFESCENS.)

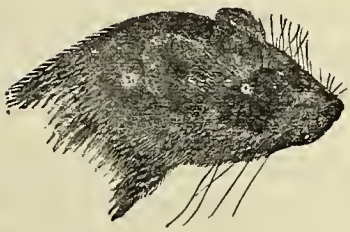
About two-thirds natural size. From colored drawing of a specimen from Carberry, Manitoba, by Ernest T. Seton.

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF BIOLOGICAL SURVEY
HENRY W. HENSHAW, *Chief*

NORTH AMERICAN FAUNA

No. 39

[Actual date of publication, November 15, 1915]



REVISION OF THE POCKET GOPHERS OF THE GENUS THOMOMYS

BY

VERNON BAILEY

CHIEF FIELD NATURALIST, BIOLOGICAL SURVEY

WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

LETTER OF TRANSMITTAL.

United States Department of Agriculture,
Bureau of Biological Survey,
Washington, D. C., April 29, 1915.

Sir: I have the honor to transmit herewith for publication as North American Fauna No. 39, a revision of the pocket gophers of the genus *Thomomys*, by Vernon Bailey, chief field naturalist of the Biological Survey.

Pocket gophers are burrowing rodents which in pursuit of food and in running tunnels often damage crops, young trees, and irrigation ditches. Moreover, the heaps of earth ejected from the tunnels not only cover more vegetation than the animals eat, but also obstruct the operation of mowing machines. Gopher burrows frequently penetrate and cut through irrigation-ditch banks, and the escaping water becomes a menace to agriculture and sometimes to human life. The animals are thus of considerable economic importance.

The present paper completes the technical revision of the pocket gophers (family Geomyidæ), the first part of which was prepared by Dr. C. Hart Merriam and published in 1895 as North American Fauna No. 8. The revision will supply definite information regarding the status and geographic distribution of the several forms, which is important in connection with attempts to control or exterminate them.

Respectfully,

Henry W. Henshaw,
Chief, Biological Survey.

Hon. David F. Houston,
Secretary of Agriculture.

CONTENTS.

	Page.
Introduction	7
General habits	8
Burrows	8
Food habits	10
Damage to crops	10
Winter habits	11
Breeding habits	11
Disposition	13
Pocket gophers as food	13
Natural enemies	13
Destruction of pocket gophers	14
General characters	14
Cranial characters	16
Dentition	17
Sexual variation	17
Molt	18
Abnormal pelage conditions	20
Albinism	20
Melanism	21
Variation and distribution	22
Material examined	30
Acknowledgments	31
Genus *Thomomys*	32
Generic characters	32
Group relationships	32
Heavy rostrum groups	32
Slender rostrum groups	33
List of species and subspecies, with type localities	34
Key to groups of related species	36
Key to species and subspecies	36
Description and distribution of species and subspecies	40
Thomomys bulbivorus group	40
Thomomys townsendi group	42
Thomomys bottæ group	45
Thomomys alpinus group	63
Thomomys perpallidus group	68
Thomomys fulvus group	80
Thomomys umbrinus group	89
Thomomys talpoides group	96
Thomomys fossor group	111
Thomomys douglasi group	116
Thomomys monticola group	121
Thomomys fuscus group	126
Index	133

ILLUSTRATIONS.

PLATES.

[Plate I, frontispiece; Plates II–VIII, following page 132.]

PLATE I. Prairie pocket gopher (*Thomomys talpoides rufescens*).

II. Skulls (ventral views) of *Thomomys bulbivorus, T. townsendi townsendi, T. bottæ bottæ, T. perpallidus aureus, T. talpoides rufescens, T. t. clusius, T. idahoensis, T. fossor, T. monticola monticola* (and lateral view of *monticola*), *T. douglasi douglasi, T. bottæ leucodon, T. ocius,* and *T. umbrinus umbrinus.*

III. Skulls (dorsal views) of *Thomomys bulbivorus, T. townsendi townsendi, T. t. nevadensis, T. bottæ bottæ, T. b. leucodon, T. b. laticeps, T. b. angularis, T. b. pallescens,* and *T. altivallis.*

IV. Skulls (dorsal views) of *Thomomys bottæ pascalis, T. b. minor, T. b. navus, T. fulvus texensis, T. f. pervagus, T. perpallidus apache, T. sinaloæ, T. b. alticolus,* and *T. b. russeolus.*

V. Skulls (dorsal views) of *Thomomys perpallidus albatus, T. p. perpallidus, T. p. perpes, T. operarius, T. p. aureus, T. p. canus, T. latirostris, T. cabazonæ, T. alpinus awahnee, T. bottæ mewa, T. b. anitæ, T. magdalenæ, T. a. alpinus, T. jacinteus, T. neglectus,* and *T. b. nigricans.*

VI. Skulls (dorsal views) of *Thomomys fulvus fulvus, T. cervinus, T. f. toltecus, T. mearnsi, T. f. intermedius, T. f. desertorum, T. baileyi, T. lachuguilla, T. perditus, T. goldmani, T. nelsoni, T. sheldoni, T. umbrinus umbrinus, T. u. peregrinus, T. u. orizabæ,* and *T. atrovarius.*

VII. Skulls (dorsal views) of *Thomomys talpoides rufescens, T. t. bullatus, T. t. nebulosus, T. t. agrestis, T. t. clusius, T. t. caryi, T. t. pryori, T. quadratus quadratus, T. ocius, T. idahoensis, T. pygmæus, T. columbianus, T. fossor, T. uinta, T. bridgeri,* and *T. quadratus fisheri.*

VIII. Skulls (dorsal views) of *Thomomys monticola monticola, T. m. mazama, T. m. pinetorum, T. m. nasicus, T. douglasi douglasi, T. d. melanops, T. niger, T. d. oregonus, T. fuscus loringi, T. hesperus, T. d. yelmensis, T. limosus, T. f. fuscus* (male and female), *T. f. myops,* and *T. f. saturatus.*

TEXT FIGURES.

Page.

FIG. 1. Map showing distribution of the genus *Thomomys* 9

2. Skins of adult females of *Thomomys*, showing number and position of mammæ in different groups and species: 1, *Thomomys umbrinus umbrinus;* 2, *T. bottæ bottæ;* 3, *T. fossor;* 4, *T. talpoides rufescens* ... 12

3. Skins of *Thomomys*, showing waves of pelage during molt: 1, *Thomomys talpoides rufescens;* 2, 4, *T. quadratus fisheri;* 3, *T. t. clusius* 19

4. Skins of *Thomomys* showing abnormal pelage conditions, due to tick bites, mange, or skin disease: 1, *Thomomys fossor;* 2, *T. fuscus fuscus* 21

5. Map showing distribution of certain species and subspecies of *Thomomys:* 1, *fuscus;* 2, *loringi;* 3, *saturatus;* 4, *myops;* 5, *columbianus;* 6, *bridgeri;* 7, *uinta;* 8, *quadratus;* 9, *townsendi;* 10 *nevadensis;* 11, *canus;* 12, *monticola;* 13, *pinetorum;* 14, *mazama;* 15, *nasicus;* 16, *helleri;* 17, *bulbivorus;* 18, *hesperus;* 19, *douglasi;* 20, *oregonus;* 21, *yelmensis;* 22, *melanops;* 23, *limosus;* 24, *niger* 23

Page.

FIG. 6. Map showing distribution of certain species and subspecies of *Thomomys:* 1, *bottæ;* 2, *minor;* 3, *laticeps;* 4, *leucodon;* 5, *navus;* 6, *mewa;* 7, *pascalis;* 8, *angularis;* 9, *diaboli;* 10, *infrapallidus;* 11, *pallescens;* 12, *alpinus;* 13, *awahnee;* 14, *neglectus;* 15, *altivallis;* 16, *jacinteus;* 17, *cabezonæ;* 18, *puertæ;* 19, *perpallidus;* 20, *albatus;* 21, *perpes;* 22, *operarius;* 23, *fisheri* 24

7. Map showing distribution of certain species and subspecies of *Thomomys:* 1, *apache;* 2, *fulvus;* 3, *tolteeus;* 4, *desertorum;* 5, *texensis;* 6, *baileyi;* 7, *mearnsi;* 8, *lachuguilla;* 9, *cervinus;* 10, *sinaloæ;* 11, *chrysonotus;* 12, *nigricans;* 13, *martirensis;* 14, *russcolus;* 15, *magdalenæ;* 16, *anitæ;* 17, *alticolus* 25

8. Map showing distribution of certain species and subspecies of *Thomomys:* 1, *fossor;* 2, *agrestis;* 3, *pervagus;* 4, *desertorum;* 5, *aureus;* 6, *latirostris;* 7, *chrysonotus;* 8, *cervinus;* 9, *intermedius* 26

9. Map showing distribution of certain species and subspecies of *Thomomys:* 1, *umbrinus;* 2, *orizabæ;* 3, *peregrinus;* 4, *atrovarius;* 5, *sheldoni;* 6, *nelsoni;* 7, *goldmani;* 8, *perditus* 27

10. Map showing distribution of certain species and subspecies of *Thomomys:* 1, *talpoides;* 2, *rufescens;* 3, *bullatus;* 4, *nebulosus;* 5, *clusius;* 6, *caryi;* 7, *pryori;* 8, *idahoensis;* 9, *pygmæus;* 10, *ocius* 28

No. 39. NORTH AMERICAN FAUNA. Nov. 15, 1915.

REVISION OF THE POCKET GOPHERS OF THE GENUS THOMOMYS.

By Vernon Bailey.

INTRODUCTION.

Pocket gophers, a group of rodents peculiar to North and Middle America, belong to the family Geomyidæ, which includes the genera *Thomomys, Geomys, Pappogeomys, Cratogeomys, Platygeomys, Orthogeomys, Heterogeomys, Macrogeomys,* and *Zygogeomys.* The present revision deals only with the genus *Thomomys,*[1] which is distinguished from the others by the practically ungrooved surface of the upper incisors. The large fur-lined external cheek-pouches are a family character shared by all genera and species, as are the general habits of living in underground burrows and throwing up heaps of earth along their lines of tunnels. The genus *Thomomys* includes 88 recognizable forms of 40 species. These vary in size from that of a small mole to that of a large rat, and in color from light buff to yellow and gray, and from many shades of brown and rusty to dusky and even black. All are short-legged, robust, sturdy little animals, with small ears and eyes, and short, smooth hair.

Gophers of the genus *Thomomys* are abundant over almost the entire western half of the United States, in a great area of southwestern Canada, and over much of Mexico (see fig. 1), covering considerably more territory than all the other members of the family together. The various forms do not overlap in range to any great extent, but in the area occupied they are present in almost every locality, and are especially abundant in fertile and valuable agricultural lands. Their burrows are a constant menace to agricultural operations, irrigation ditches, and reservoirs. Their food is entirely of vegetable matter, and of this roots, bulbs, and cultivated crops are preferred. In destroying crops and fruit trees they cause a heavy loss to western

[1] In 1895 Dr. C. Hart Merriam monographed the family Geomyidæ, exclusive of the genus *Thomomys* (N. Am. Fauna No. 8), and also included a chapter on the anatomy and relationships of *Thomomys* and a map of the genus without reference to its specific and subspecific divisions. It was my privilege to assist him in working over the material for his monographic revision and later I was assigned the task of completing the revision of the genus *Thomomys.*

farmers each year, and it is necessary in farming areas to use every possible means of restraining their increase and checking their depredations. In wild land, on the other hand, their presence is highly beneficial, not only because they stir the soil and enrich it by burying vegetation under their mounds, but also because they form a network of underground channels which aid materially in retaining water and carrying it deeper into the ground. Such of their beneficial habits as have operated for ages in enriching the western soils are far overbalanced in agricultural lands by their destructive habits. On lands newly brought under cultivation it is often necessary to wage an active campaign against gophers, in order to render the crops fairly safe. (See footnote, p. 14.)

The present paper describes the recognizable species and subspecies and defines their geographic distribution so far as at present known.

GENERAL HABITS.

BURROWS.

Pocket gophers of the genus *Thomomys* are burrowing animals which spend most of their lives underground. The several species have practically the same habits except as modified by environment. They are sturdy little miners, drifting their tunnels on and on in search of food, throwing out little heaps of earth along the lines of excavation, and then quickly closing the doorway. The tunnels vary from about 6 inches to a foot below the surface, and from about 1½ to 3 inches in diameter, according to the size of the gopher. The length of the tunnels is practically interminable and their course varies from a winding network to long direct lines.

The character of the burrows is determined by the food supply. A row of potatoes may be followed across a field, or the spreading roots of an apple tree may hold the attention of the gopher for some time. If food is scarce the rows of mounds reach in direct lines for long distances, but when it is abundant they wind back and forth within a limited area. While the males move about more freely at the beginning of the breeding season and there are indications of rare migrations, pocket gophers are evidently the most restricted in their habitat of any of our native mammals. Even moles, which live more completely underground, burrow more rapidly and travel more widely. The whole summer's line of hills of one gopher can often be seen at a glance. The animals rarely leave an alfalfa or potato field, but hurry across waste places. Under ordinary circumstances, however, a gopher often spends a year on a single acre, and perhaps the next year on an adjoining one. Most gophers probably never get 40 rods from where they were born, but where environment is less favorable and the gopher is more active, he may extend his tunnels for half a mile or possibly a mile during his career.

Little mounds of earth, thrown out as the burrows are excavated, and varying in bulk normally from a quart to a bushel and in distance from a close proximity to 15 feet apart, mark the lines of the

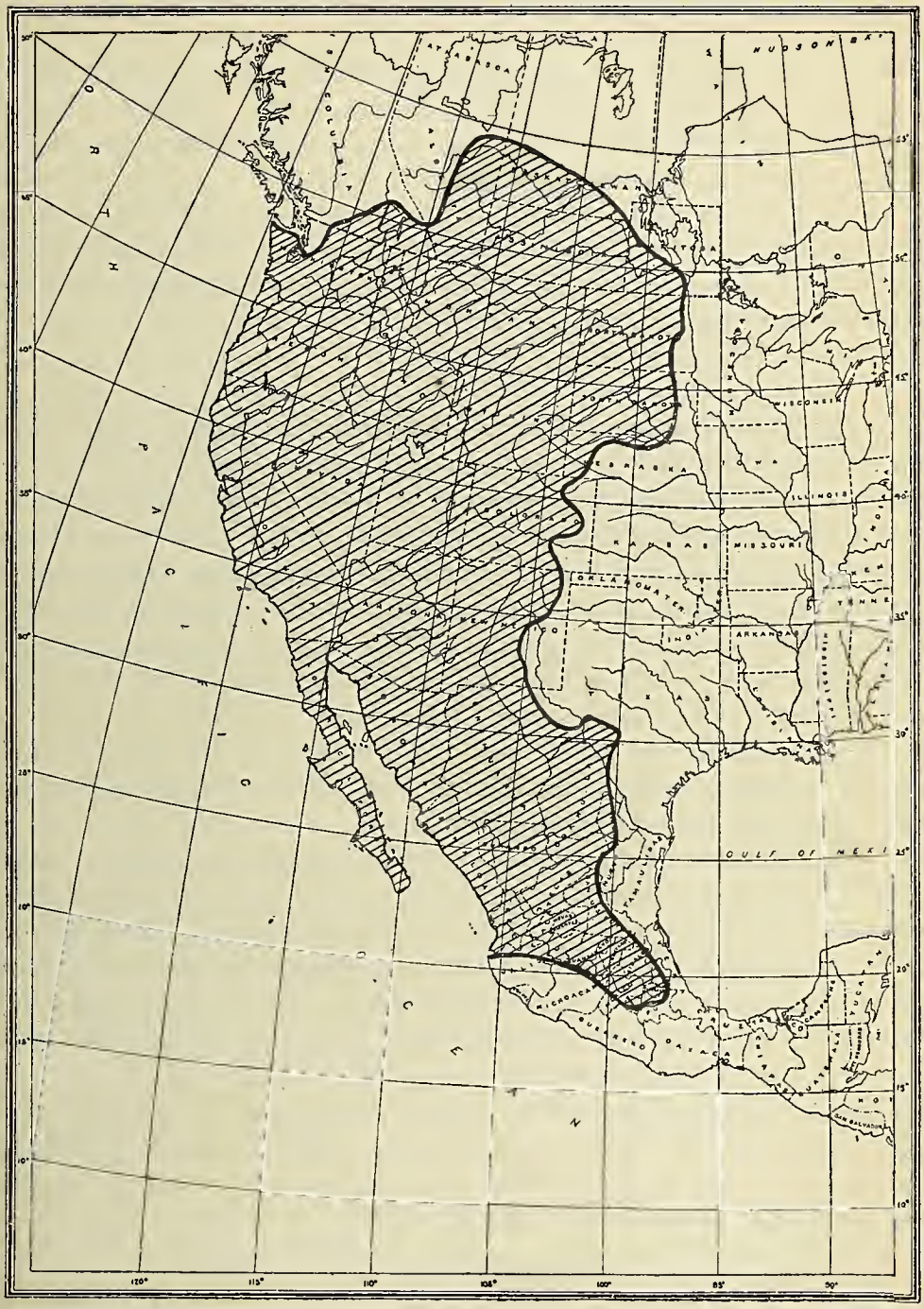


FIG. 1.—Map showing the distribution of the genus *Thomomys* (shaded area).

burrows. After the loose soil is pushed out, the openings are securely packed with earth and closed from within as a fortification against enemies. The entrances are often closed so securely that even the experienced trapper has difficulty in locating the burrow beneath.

Usually, however, the opening may be found by the depression where the last load of earth was left, and the direction of its slope downward determined by the position from which the mound of earth was pushed out. This also serves to distinguish a gopher hill from a molehill, as the mole pushes up the earth from below without making an opening to the daylight. Often the opening is near some plant, as the gopher evidently recognizes a choice species by the root and, following it to the surface, devours or carries it away.

These mounds or "gopher hills," frequently cover low vegetation; on wild land this serves to enrich the soil, but in fields and meadows they often cover and destroy the growing grain and forage, and also interfere with mowing and harvesting.

FOOD HABITS.

Gophers of all species of *Thomomys* are strict vegetarians. Their food consists for the most part of roots, bulbs, tubers, and the most edible and nutritious underground parts of plants, but it includes also much green vegetation from aboveground. As they extend their tunnels gophers find wild onions, liliaceous bulbs, wild potatoes, underground beans, grass tubers, and an endless number of edible roots. These are cut in sections or, if of convenient shape and size, tucked in the pockets whole, and when the pockets are well filled are carried to the dining room to be eaten at leisure or deposited in the storeroom for future use. When gophers are trapped their pockets usually contain articles of food, sometimes so much that they stand out on both sides of the head.

The list of plants found in the pockets is long and varied. Some of the fleshy desert plants, as cactuses, yuccas, agaves, and sotol are entered from below and the juicy centers eaten out. Wild clovers and a great many leguminous plants are favorite foods, while grass stems and blades are eaten to some extent. Very small bushes are sometimes cut down near the burrows and the bark eaten, but trees are rarely injured aboveground.

Gophers apparently do not require water, and it is doubtful if they drink at all. Many desert species thrive for long periods, sometimes a year or more, where they can not get water, but green food and juicy roots evidently supply all the moisture they need.

DAMAGE TO CROPS.

Pocket gophers show a keen appreciation of man's efforts in agriculture and horticulture by resorting to cultivated areas. They revel in potato fields, and one gopher will destroy a long row of the tubers, taking one hill after another from the time they first appear until they are harvested. They quickly attack newly planted areas,

and where potatoes are stored in the field they often enter the pits to eat the tubers or carry them away. All kinds of garden vegetables and also most field crops are eagerly eaten, either below or above the surface of the ground. Gophers sometimes burrow up into pumpkins or squashes and eat out the insides without the mischief being detected until the empty shells dry up. They will work all summer in grain fields, cutting and eating the leaves, stems, and grain heads and covering with their hills of earth even more grain than they eat. In alfalfa and clover fields and in grass meadows they destroy both roots and tops and pile their mounds over much of the crop, and in addition, by leaving their mounds full of small stones, they dull and break the knives of mowing machines. Their mischief is perhaps most exasperating in orchards and nurseries, as they often injure or kill choice fruit trees by their underground operations. They are very fond of the roots of apple, pear, and fig trees.

In irrigation areas gophers have an annoying habit of burrowing through the ditch banks and letting the water cut its way out, of filling up the smaller ditches with their mounds, and of interfering generally with the most efficient use of water. It is reported that in the spring of 1915 their burrows caused two reservoir dams on the Little Colorado River, near St. Johns, Ariz., to give way, causing the death of eight persons by drowning, and damage to crops to the extent of half a million dollars.

WINTER HABITS.

Apparently none of the pocket gophers hibernate, and in spring, as the deep snows melt, their old burrow-molds are seen snakelike over the surface of the ground as evidence of winter activity. They work below the frost and instead of throwing out mounds they tunnel under the snow along the surface of the ground, probably gathering some green plants as they go, and then fill these snow tunnels with earth from their burrows. This earth freezes and hardens and often remains all summer as earth casts of gopher burrows in the snow. The long safe winter under protection of the snow has probably done much to conserve the species and facilitate their wide dispersal and abundance in high mountains and northern areas.

BREEDING HABITS.

The little known of the breeding habits of *Thomomys* barely suffices for a few general conclusions. In northern and more elevated portions of the country female gophers usually contain small embryos in June, and early in that month a male and female are occasionally caught in the same burrow. This rarely happens later in summer, and it is evident that only one litter of young is regularly raised in a year. In warmer climates the young are

born earlier, and in some regions two litters may be raised. Though I have collected many specimens, I have never seen one younger than the nearly half-grown stage, when they begin to move about, nor have I found specimens of young in any of the museum collections. During July and August many half-grown gophers are

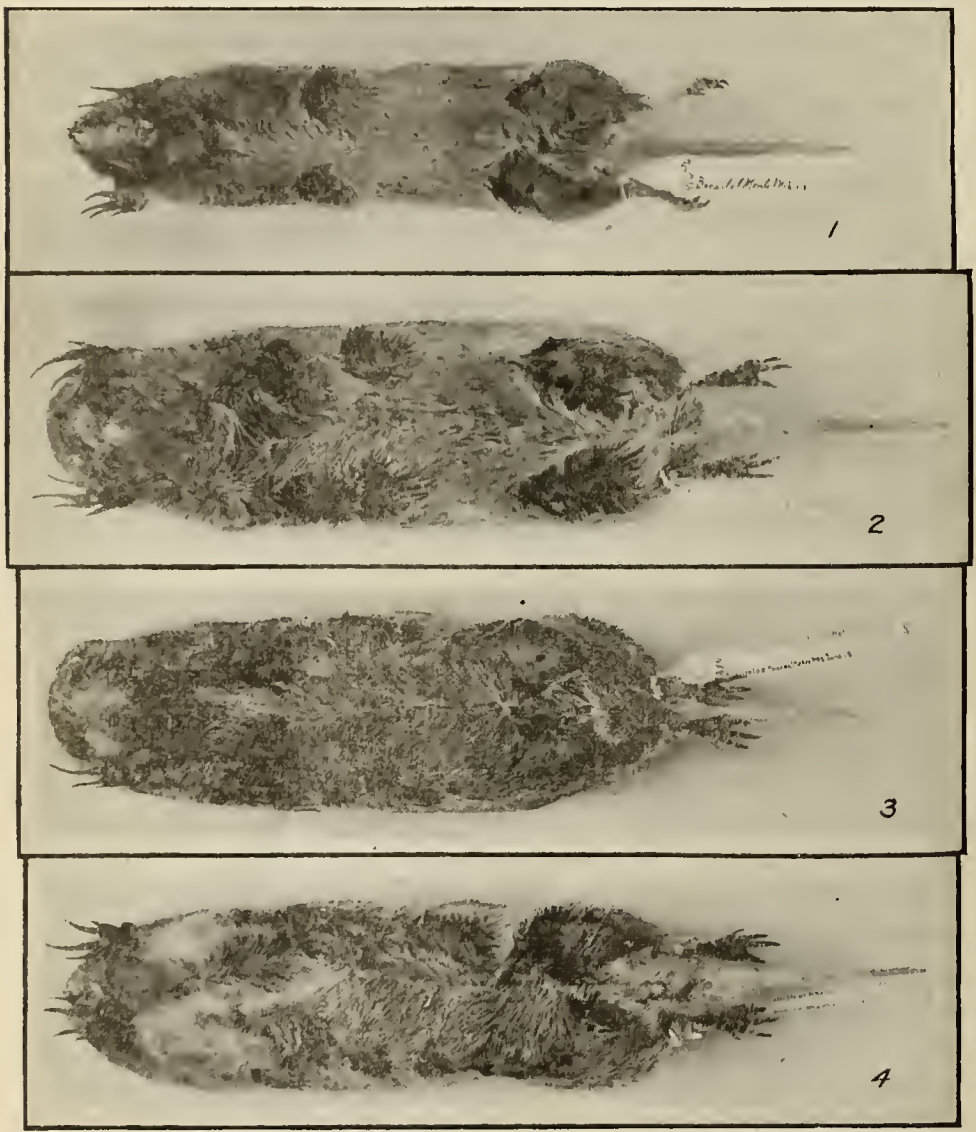


FIG. 2.—Skins of adult females of *Thomomys*, showing number and position of mammæ in different groups and species. (Exact location of nipple indicated by black dot. Relative position of posterior pairs often distorted by method of sewing up skin.) 1, *Thomomys umbrinus umbrinus;* 2, *T. bottæ bottæ;* 3, *T. fossor;* 4, *T. talpoides rufescens.*

caught in traps, but then they are working in the parent burrow or starting new lines for themselves. A little later old and young are in independent burrows.

The number of young in a litter varies in the different species, as might be expected from the variation in the number of mammæ

in the females (fig. 2). In the *umbrinus* group from Mexico, with 3 pairs of mammæ, the number of embryos has been recorded as 2 and 3. In other species, with 4 pairs of mammæ, the number of embryos has been recorded as 4 and 5, while in the *clusius* and *ocius* groups, with 6 and 7 pairs of mammæ, 6 and 7 embryos seem to be the rule. Judging from nearly matured fetuses the young are born helpless and naked, and must remain for some time in the nest while cared for by the mother. Apparently nothing is known of their nests or breeding quarters.

DISPOSITION.

Like all of the family, gophers of the genus *Thomomys* are pugnacious and fight man or dog as quickly as they would an animal of their own size. To the gopher everything that moves is an enemy and is attacked with vicious wheezing and savage bites. The toe of a boot or a stick is seized, and the heavy incisors make deep cuts into wood or quickly cut through leather. The weasel is probably the gopher s only enemy of its own size that successfully attacks and masters it in its burrows. The gopher's vision is extremely limited, and it seems not to see an object until very close, when its instinct of self-preservation suggests prompt attack.

POCKET GOPHERS AS FOOD.

These gophers are not only strict vegetarians, but are in every way cleanly and exemplary in their food habits. Their flesh is tender and well flavored, and were the animals large enough they might be made a valuable adjunct to our meat supply. They have furnished me with many a palatable meal in the mountains when other food was not available, and would have been of great value to early explorers, who suffered from starvation, had a few gopher traps been carried across the mountains and deserts. Two or three gophers broiled over the coals of the camp fire furnish a fairly substantial and palatable meal, especially if accompanied by a stew of wild onions and bulbs of the camas. Gophers are hardly large enough to be worth catching for the market, however, but where large numbers must be destroyed to protect crops, some may be utilized for the table. The meat is rather dark and fine-grained, tender, and in flavor not unlike that of the squirrel. Sometimes it is rather strongly flavored with wild onions, but to some this is not unpleasant.

NATURAL ENEMIES.

While the underground life of pocket gophers would seem to render them safe from attacks of enemies, yet they are preyed upon by a great variety of animals. Hawks and owls pick up so many of them at their doorways that gopher bones are among the most abundant

in the pellets of these birds. Coyotes, foxes, and bobcats pounce upon them as they push out their loads of earth, and badgers occasionally dig them out. Weasels are probably their greatest enemies, and when one gets into a gopher burrow there is no escape for the occupant. Snakes also prey upon them to such an extent that one common species is known as the gopher snake. The protection of such natural enemies of the gopher as prove least harmful in other ways, notably hawks, owls, weasels, and badgers, is of the utmost importance as an adjunct in the control of what is proving in many sections one of the worst of our rodent pests.

DESTRUCTION OF POCKET GOPHERS.

Pocket gophers are easily trapped and poisoned, and on limited areas may be reduced to harmless numbers by systematic, intelligent effort. In extensive fields and meadows and along systems of irrigation ditches or reservoirs their control often presents problems of considerable magnitude. The Biological Survey has made special study of the many conditions under which injuries from gophers occur and of the most economical and efficient means of their control. The results have appeared in several publications of the United States Department of Agriculture. [1]

GENERAL CHARACTERS.

The short legs, strong frame, and powerful muscles of pocket gophers peculiarly fit them for subterranean life. The long front claws vary considerably in size with the different species, being largest in *T. talpoides* and *T. rufescens*, which are medium-sized species, and relatively smallest in *T. bulbivorus*, the largest of the genus; but in all they are well adapted to rapid digging. The stout hind feet, with wholly naked, plantigrade soles and stout nails are well adapted to pushing, while the delicate naked soles of all the feet are doubtless of great advantage as a substitute for eyes in an animal which spends most of its life in utter darkness. Fringes of stiff bristles bordering the fingers and palms evidently assist in holding together the loose earth as it is pushed out of the burrow. The very small eyes and ears are keen at close range, but are of little use in the burrow where most of the animal's life is spent. The stubby and seemingly rather useless tail is slightly tapering, thinly haired, and often naked near the tip. It probably serves as a substitute for eyes in the animal's rapid backward progress through its burrow, as has been shown

[1] Pocket Gophers of the United States, by Vernon Bailey. Bul. No. 5, Division Ornithology and Mammalogy, 1895.

Directions for Destroying Pocket Gophers, by David E. Lantz. Circular No. 52, Biological Survey, 1908.

Harmful and Beneficial Mammals of the Arid Interior, by Vernon Bailey. Farmers' Bulletin 335, 1908.

Pocket Gophers as Enemies of Trees, by David E. Lantz. Yearbook Separate No. 506, 1909.

by Dr. Merriam to be the case with the very similar and closely related genus *Geomys*.[1] The vibrissæ are of just sufficient length to span the diameter of the burrow and doubtless serve as a further substitute for eyes.

The general pelage is fine and silky, becoming long, full, and soft in winter in cold climates and again becoming thin and harsh in summer. In the southern tropical or subtropical species the fur, if it may be called fur, seems not to attain the full soft winter coat. The pelage consists of a fine all-plumbeous underfur through which rises a longer, coarser coat with plumbeous base and colored tips which give the dominant shade characterizing the species. This usually varies considerably with the season, in some species becoming much darker in winter, in others much paler. The covering on the underparts is usually much thinner, often allowing the skin to show through. The tail, ears, and tops of feet are but thinly clothed with short, stiff hairs. The small nose-pad is naked.

The construction of the mouth is such that both upper and lower incisors protrude from fur-incased mandibles, allowing perfect freedom for cutting roots, digging in hard earth, or prying out stones without danger of the earth entering the real mouth, which opens vertically well back of the incisors and closes automatically as the incisors are spread wide apart. The fur-bordered lips close in a vertical slit in front of the real mouth or draw back and expose an ample cavity and a thick, fleshy tongue.

The pockets, which give the animal unusual interest, have been the cause of much speculation and misapprehension. Some of the specimens first seen by naturalists were stuffed with the pockets wrong side out, Say's genus *Pseudostoma* being based on such a specimen, while Kuhl's *Saccophorus* was based on a specimen showing the pockets in their real position. The use of the pockets is still often misunderstood. They are external invaginated folds of skin, fur lined, and opening along each cheek parallel with the mouth and extending approximately $1\frac{1}{2}$ to 2 inches back under the skin of the shoulder. They are very elastic and when empty might pass unnoticed, but when filled they more than double the apparent size of the animal's head. I have often thrust two fingers half their length into the two pockets of a small-sized gopher, reaching back almost to the middle of the animal's body. In large species the thumb fits nicely in the empty pocket. In removing a gopher's skin a thin band of muscle is discovered attached to the apex of each pocket and by it they are drawn back and kept in place. The pockets can not be fully everted without greatly stretching or possibly breaking this muscular attachment, but they can be drawn out so that a large fold of the lining will hang out of the pocket when the animal's muscles are relaxed. It is a common belief that the pockets are used

[1] N. Am. Fauna No. 8, 16, 1895.

in carrying earth from the burrows, but such is not the case as, in preparing many hundreds of specimens, I have never found earth in the pockets, except for minute particles from roots and bulbs. Other naturalists have given the same negative evidence. On the other hand, the pockets are commonly stuffed full of vegetation. I have often watched the gopher come to the surface, opening a new doorway as he came, and begin to draw down one plant after another, cutting and tucking away the sections in his pockets as he drew them down. His motions are quick as a flash, and that the hands are used in filling the pockets is about all one can be sure of. Dr. Merriam found by watching a captive specimen of *Geomys* that the hands were used for both filling and emptying the pockets.[1]

CRANIAL CHARACTERS.

In Dr. Merriam's very full discussion of the morphology of the skull in his Monographic Revision of the *Geomyidæ*[2] numerous figures and illustrations of the genus *Thomomys* are included. In the present work it is therefore necessary only to mention some of the variations and general characters useful in the separation of the various forms.

In all, the cranium is wide and low, with spreading zygomatic arches for the accommodation of powerful muscles. The mandibles are heavy and irregular, and the incisors above and below are long, curved, deeply embedded tools of labor and weapons of defense. The relative length and breadth of the skull vary greatly in different species: shortening of the total length generally implies a relatively wider skull; elongation a relatively narrower. In some species, however, the rostrum alone is elongated or shortened, in others the braincase varies in length and breadth. The generally wedge-shaped nasals are extremely variable in length and form, especially in form of termination at posterior tips. The premaxillæ in some terminate even with the posterior line of the nasals, in others they extend well back into the frontals with pointed, beveled, or truncate tips.

The interparietal furnishes a convenient character for the recognition of many forms, varying from a minute oval to a large quadrate bone covering nearly half the basal width of the skull. In some species, however, it is obscured in old age until completely obliterated in a high sagittal crest, in others advanced age produces no appreciable change. The various forms of the line of junction between the base of the zygomatic processes of the maxillæ and the premaxillæ and frontal and lachrymal bones furnish excellent specific as well as group characters. In the *umbrinus* group the bases of these bones are forked or concave; in most others convex, straight, or doubly curved. There are often good characters in the symphysis of the zygomatic process

[1] N. Am. Fauna No. 8, 18, 1895. [2] Ibid., 33 and 198, 1895.

of the maxilla and the jugal, but this changes considerably with age and is not much used in diagnoses. The pterygoids have a wide range of variation and furnish excellent characters in many species. The large and concave pterygoids of *T. bulbivorus* have been used as the main basis for a subgenus (*Megascapheus*),[1] but while unique they certainly do not carry more than specific distinction. The general variation is in elevation or depression of the wings of the pterygoids, wide or narrow, and sharply V-shaped or widely U-shaped fossa. The audital bullæ vary greatly in relative size and form, the largest being smoothly rounded and globose, the smaller more elongated and angular. The basioccipital varies greatly in relative length and width, generally becoming narrower as the bullæ increase in size and crowd upon its margins. Many slight detailed differences can also be used to advantage as characters. Many excellent characters in the lower mandibles are not generally used in diagnoses, as in most forms there are others more convenient.

DENTITION.

The dental armature of *Thomomys* is included and fully discussed with the other genera in Dr. Merriam's revision of the Geomyidæ.[2] Throughout the genus *Thomomys* there is surprising uniformity of tooth form and enamel pattern in the molariform teeth; while many minute variations furnish distinctive specific characters, the necessity of studying them with a lens renders them inconvenient for general use, and they rarely serve to separate closely related forms. On the contrary, the incisors furnish conspicuous group as well as specific characters. The angle of the upper incisors to the axis of the skull varies from the very protruding incisors of *T. bulbivorus*, *T. leucodon*, and *T. umbrinus* to the abruptly incurved incisors of *T. pygmæus*, *T. idahoensis*, and *T. ocius*. A narrow groove near the inner edge of each upper incisor is deepest and most conspicuous in the *monticola* group, but so slight and obscure in other groups as to be detected only by critical examination with a lens; it is usually most obscure in species with projecting upper incisors. In some species the incisors are rather slender, and in others relatively stout.

SEXUAL VARIATION.

The male in most species is considerably larger than the female and its skull is heavier, more angular, and more heavily ridged in old age. This sexual difference is greatest in the *bottæ* group and apparently least in the *monticola* and *fuscus* groups, but is noticeable in all.

The functional mammæ vary in fully adult females of different species from 3 to 7 pairs, usually arranged in 2 pairs of inguinal, 2 or

[1] Elliot, Field Columb. Mus., zool. ser. III, 190, 1903. Type, *Diplostoma bulbivorum* Richardson.
[2] N. Am. Fauna No. 8, 69–108, 1895.

none of abdominal, and 1, 2, or 3 of pectoral. The usual number of embryos ranges from 3 to 7.

MOLT.

In the genus *Thomomys* there seem to be normally two complete changes of pelage during the year, from the winter to the summer coat during spring or early summer, and from the summer to the winter coat in fall. The time of these changes varies in different species and often in the same species with different climatic conditions, and apparently also with the varying physical condition of individuals, as age and bodily vigor. In the northern and more elevated areas the molt is more pronounced and its progress more rapid, owing to greater extremes of climate; while in the equable climate of the west-coast areas and in the Tropics of western Mexico very gradual and slight change of pelage occurs. The progress of the molt is normally from the nose over the head and body to the base of the tail along a crescentic line, a little faster on the back than on the sides. On the belly the molt lags behind and is less regular.

The spring molt is most conspicuous, as each succeeding wave of hair is shorter than that displaced and leaves a dark line of plumbeous basal color exposed on the old hair. The change is a creeping process. New hair displaces old on the nose, apparently pushing out the old and worn and taking its place along the line of advance backward and downward. The line is normally a semicircle, but it often becomes distorted by one part progressing more rapidly than another. In some cases the change is complete as it progresses, all the old hair being replaced, but in others the molt is only partial, a thinning or filling-up process, but always progressing along the line in the same way. In spring the first molt wave and often those up to the fifth are but slight changes, a thinning like the removal of one winter shirt after another, but the final, perhaps fifth or sixth, change to the thinnest summer clothing is a complete change as it progresses. The number of molt waves is not easily determined from specimens, as they often overtake and run into each other. The long winter coat is retained on the rump often until late summer, and the successive molt waves strike against this until the short summer coat pushes it off at the base of the tail just before, or sometimes, in high or northern localities, not until, the next winter coat has begun to make its appearance on the nose. There are at least five waves in the spring molt, as this number appears on many specimens taken in May or June. Those taken later in summer usually show a less number of coats but with more deeply marked division lines due to the combination of several waves into one or more.

The fall molt is different. The winter coat is put on more rapidly with the appearance of really cold weather, and apparently the full change is accomplished in two molt waves that begin at the nose and

progress over the animal along a semicircular line. The line is not so conspicuous, however, as the longer hair overlaps the short summer coat which it is crowding out, and does not exhibit the plumbeous color along its margin. Often before the first coat has reached the

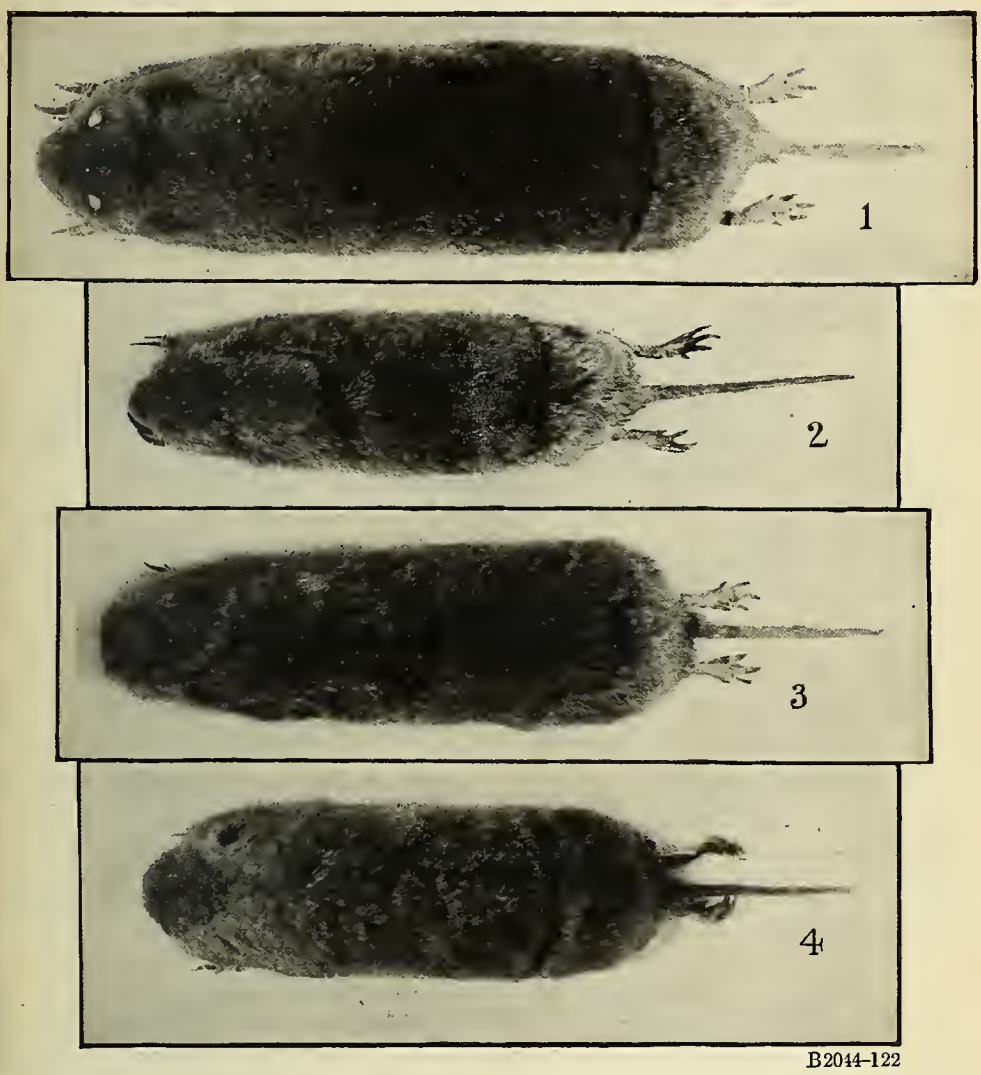


FIG. 3.—Skins of *Thomomys* (U. S. Nat. Mus. specimens) showing waves of pelage during molt.

1. *Thomomys talpoides rufescens*, male adult, No. 180486, Valley City, N. Dak., May 17, 1912, showing five waves of pelage during spring molt.
2. *Thomomys quadratus fisheri*, male adult, No. 94411, Ruby Valley, Nev., June 23, 1898, showing four waves of pelage during spring molt.
3. *Thomomys talpoides clusius*, female adult, No. 160396, Shirley Mountains, Wyo. (8,800 feet altitude) Aug. 21, 1909, showing three waves of spring molt, with coat of previous winter on rump and two waves of fall molt coming in on head: two winter coats at one time.
4. *Thomomys quadratus fisheri*, male adult, No. 80721, Cottonwood Range, Nev., Sept. 17, 1896, showing first wave of fall molt back to rump, second wave back to ears.

base of the tail the second has begun on the nose and is following the first (fig. 3). This seems not to replace the first but to fill up and thicken the coat, while both may increase in length as the weather becomes more severe.

Climatic conditions control the time and nature of molt, but not its general plan. Species from high in the mountains and from well north wear heavy winter coats for a longer time: *T. talpoides* from October to April; *T. fossor* and *T. fuscus* from October to May; while those from low hot valleys—*T. perpallidus, T. albatus,* and *T. chrysonotus*—wear thinner winter coats from about the first of December to the first of March. Species from the California coast show the usual molts, but with slight contrast between summer and winter, and with considerable individual variation in dates of change. The one fully tropical species, *T. atrovarius,* from western Mexico, is represented by specimens taken from April 5 to August 3, in most of which one molt line appears across the back, and none shows more than one, while there are several without any trace of molt. This condition is rarely found in any other species in summer pelage and is probably due to the tropical climate. Specimens showing a molt line seem to be changing from one thin, harsh pelage to another exactly like it, and whether there is any change to a winter pelage in this species remains to be shown by winter specimens.

When the young, which are evidently born naked, are old enough to begin moving about, they have a fine, short coat of silky hair, which a little later becomes longer and more lax as well as finer and softer than in adults, and when they are about half grown the molt begins on the nose and progresses slowly as in adults, with but one molt to adult summer pelage. This change is not completed until the animal is almost grown, and while it resembles the faded and old worn pelage of adults, it can be recognized by its finer, softer texture.

The number and sequence of molt waves can be satisfactorily determined only by a study of living animals as a supplement to the large series of specimens available.

ABNORMAL PELAGE CONDITIONS.

ALBINISM.

Albinism is rare in the genus *Thomomys,* but a number of specimens examined are fully albinistic and others partially so. One albino of *T. bottæ* from San Francisco is in the U. S. National Museum collection, and Townsend speaks of a "perfect albino" presented to him at San Diego.[1] Two specimens of *T. fuscus* in the Biological Survey collection from Shuswap, British Columbia, are pure white all over. A pure white specimen lacking all of the skull except the front teeth was given me at Scottsburg, Oreg., but the species was not identifiable; it was probably *T. niger,* a species otherwise known only from pure black specimens. Specimens of *T. awahnee* from the Yosem-

[1] Proc. U. S. Nat. Mus. X, 177, 1887.

ite, *T. mewa* from Fresno Flat, Cal., and *T. pascalis* from Fresno, Cal., show large white patches on backs, arms, and breasts, and one of *T. yelmensis* from Tenino, Wash., shows white patches on one side. The white patches below, on chin, breast, or belly, are often constant and furnish good specific or subspecific characters. Two specimens of *T. aureus* from Shiprock, N. Mex., are light gray all over from a predominance of white or light gray hairs. One of *T. nevadensis* from Battle Mountain, Nev., is hoary over the head and back from a generous sprinkling of white hairs. A specimen of *T. fossor* from the Cochetopa Forest, Colo., is also gray over the head and back in the same manner, but this may belong to another series of abnormal color variation, caused by ticks or skin disease (fig. 4).

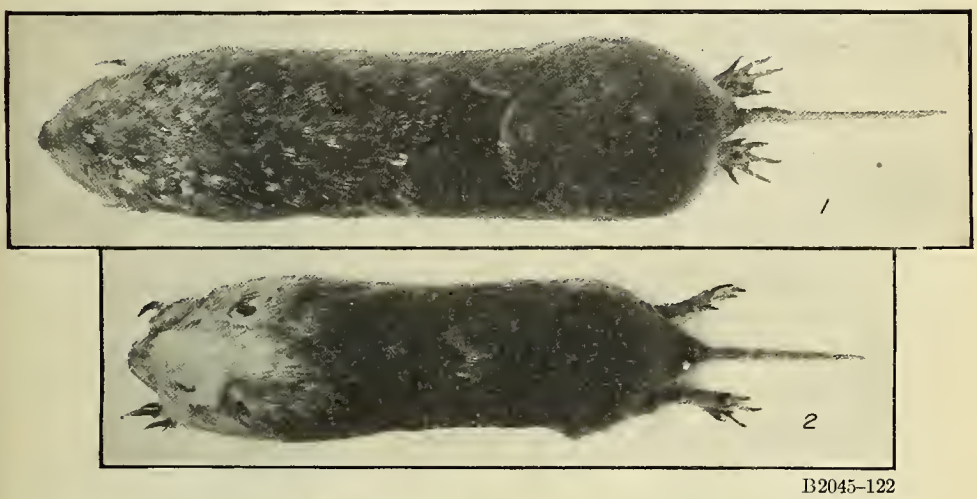


FIG. 4.—Skins of *Thomomys* (U. S. Nat. Mus. specimens), showing abnormal pelage conditions.

1. *Thomomys fossor*, No. 137661, female adult, Arapahoe Pass, Colo., July 5, 1905. The abnormal white specking is probably due to tick bites.
2. *Thomomys fuscus fuscus*, No. 72949, female adult, Tobacco Plains, Mont., July 8, 1895. The white on head may be due to ticks, mange, or skin disease.

MELANISM.

Melanism is much more common than albinism, as one species, *T. niger*, is known only from pure black individuals, and six other species are more or less melanistic. In *T. townsendi*, from southern Idaho, there are 5 black specimens and 12 of the normal gray. The Biological Survey series contains 36 normal yellow-gray, 18 black, and 10 dark gray individuals. In *T. orizabæ*, of southern Mexico, 14 out of 16 specimens from the type locality on Mount Orizaba are black. Of 8 specimens of *T. umbrinus* from Boca del Monte 4 are almost black and 4 are dark brown. In a series of 11 specimens of *T. atrovarius*, 3 are almost black. One specimen of *T. peregrinus* is fully melanistic, but dichromatism may be rare in the species, as specimens from many other localities are normal. In a large series of specimens of *T. alticolus* from southern Lower California 4 are so dark

as to be considered partially melanistic. There are two black skins of *T. talpoides* from Red Deer, Alberta; one of *T. rufescens* from Fish Lake, in the Turtle Mountains, N. Dak.; one of *T. fulvus* from Trumbull Mountains, Ariz.; one of *T. toltecus* from Fairbanks, Ariz.; and several specimens of *T. bottæ* from widely separated localities in California. This is by no means an exhaustive list of melanistic specimens, but merely serves to show how common and widely represented is this variant phase.

Abnormal marking of another type is undoubtedly caused by tick bites. In many specimens of *T. fossor* from the mountains of Colorado, Wyoming, and New Mexico small white specks occur scattered irregularly over the top of head and shoulders, giving the animal a speckled appearance similar to that of tick-bitten Texas horses. The fact that these occur only on the parts of the gophers' bodies not to be reached by their teeth strongly suggests as their origin the presence of small ticks which engorge and remain attached to the skin long enough to produce sores, which when healed are covered with white instead of normal hair. Gophers with speckled heads are represented from Colorado by specimens from 3 and 7 miles east of Cochetopa Pass, from Hahns Peak, Rabbit Ear Mountains, Elk Head Mountains, Longs Peak, Estes Park, Baxter Pass, and Pearl; from Wyoming, by a specimen from Bridger Peak; from Utah, by specimens from the Beaver Mountains; and from New Mexico, by specimens from Costilla Pass, Costilla River (near source), Red River (near source), Taos Mountains, and Twining.

A somewhat similar abnormal condition is found in a few specimens of *T. fuscus* from northwestern Montana. The top of the head and shoulders becomes gray from a considerable mixture of white hairs. The hair has a thin and unnatural appearance, the result, it has been suggested, of mange or a similar skin disease.

VARIATION AND DISTRIBUTION.

The great variety of slight characters and lack of more trenchant characters over a wide range, the abundance and almost continuous dispersal of the genus in this range, and the evident uniform vigor of the whole group indicate that the genus is at the height of its development. It has pushed out from the other perhaps older, more widely differentiated genera of the Geomyidæ and covered more territory and produced more species and subspecies than all the rest of the family. In 1895 Dr. Merriam recognized in the Geomyidæ, exclusive of *Thomomys*, 8 genera embracing 37 species. The genus *Thomomys*, without even a valid subgenus,[1] contains at least 88 recognizable forms of 40 species, and occupies about twice the area of the rest of the family. (See figs. 5 to 10.)

[1] See first footnote, p. 17.

Thomomys shows its vigor and adaptability by occupying the territory not inhabited by other more robust members of the family, which

FIG. 5.—Map showing distribution of certain species and subspecies of *Thomomys*, and localities at which specimens were collected.

1. *fuscus.*	6. *bridgeri.*	11. *canus.*	16. *helleri.*	21. *yelmensis*
2. *loringi.*	7. *uinta.*	12. *monticola.*	17. *bulbivorus.*	22. *melanops*
3. *saturatus.*	8. *quadratus.*	13. *pinetorum.*	18. *hesperus.*	23. *limosus.*
4. *myops.*	9. *townsendi.*	14. *mazama.*	19. *douglasi.*	24. *niger.*
5. *columbianus.*	10. *nevadensis.*	15. *nasicus.*	20. *oregonensis.*	

hold the milder, more luxuriant valleys. It lives in almost every desert valley and rugged desert range of mountains, as well as on the

semiarid plains and stony slopes of the great mountain ranges, and even up through the mountain forests to timber line and often far

B2047-122

FIG. 6.—Map showing distribution of certain species and subspecies of *Thomomys*, and localities at which specimens were collected.

1. *bottæ.*	6. *mewa.*	11. *pallescens.*	16. *jacinteus.*	21. *perpes.*
2. *minor.*	7. *pascalis.*	12. *alpinus.*	17. *cabezonæ.*	22. *operarius.*
3. *laticeps.*	8. *angularis.*	13. *awahnee.*	18. *puertæ.*	23. *fisheri.*
4. *leucodon.*	9. *diaboli.*	14. *neglectus.*	19. *perpallidus.*	
5. *navus.*	10. *infrapallidus.*	15. *altivallis.*	20. *albatus.*	

above on the peaks and crests of high ranges. That these gophers however, prefer comfortable conditions and thrive on mellow

soil and an abundant food supply is shown by the development of more robust species under such favorable environment. All the larger species inhabit rich valley bottoms. The smaller are mainly

Bullfrog
Death Valley
Keeler
Owens Lake
Salt Wells Valley
Ivanpah
Barstow
San Bernardino
Banning
Palm Springs
Indio
Salton Sea
Imperial
Yuma
Mexicali
Ensenada
San Quintin
San Fernando
Angel de la Guarda
Tiburon
Cedros
Bahia Vizcaino
Cabo Virgenes
Santa Rosalia
San Ignacio
Bahia Magdalena
Punta Abrejos
Sta Margarita
Magdalena
San Jose
Espiritu Santo
Calraivo
La Paz
San Jose del Cabo
Cabo San Lucas
Carmen
Loreto
Mulege
Guaymas
Hermosillo
Altar
Nogales
Bacoachi
Magdalena
Casa Grande
Sentinel
Phoenix
Florence
Globe
Holbrook
Winslow
Flagstaff
Williams
Prescott
Ashfork
Kingman
Peach Springs
Grand Canyon
Supai
Kanab
Hurricane
St George
Moapa
Las Vegas
Stone Ferry
Bullfrog
Beatty
Rhyolite
Tonopah
Goldfield
Lida
Silver Peak
Lees Ferry
Tuba
Keams Canyon
Ft Defiance
Gallup
Fort Wingate
Laguna
Albuquerque
Santa Fe
Las Vegas
Santa Rosa
Tucumcari
Roswell
Clovis
Portales
Carlsbad
Las Cruces
El Paso
Juarez
Deming
Hachita
Lordsburg
Silver City
Socorro
San Marcial
Carrizozo
Alamogordo
Tularosa
Cloudcroft
Pecos
Toyahvale
Davis Mts
Marfa
Sierra Blanca
Fort Hancock
Grandes
Galeana
Colonia Garcia
Chihuahua
Pinos Altos
Boquillas
Rio Conchos
Rio Grande
Rio Florido
Rio Nazas
Rio Sonora
Rio Yaqui
Rio Mayo
Rio Fuerte
Rio Sinaloa
Rio Piaxtla
Rio Presidio
Rio Grande
Rio Concho
Rio Pecos
Rio Puerco
Rio Grande
Rio Salado
Rio Gila
Rio Colorado
Rio Virgin
Rio Verde
Rio Bravo
Rio Grande
Rio Grande
Rio Grande

ferocious dispositions of all members of the family. For about 2,000 miles the ranges of *Geomys* and *Thomomys* meet across the Middle West from Pembina, N. Dak., to the lower Rio Grande, apparently without actual overlapping. The same conditions occur along the ranges of large and small species of *Thomomys*, as at Fort Bridger,

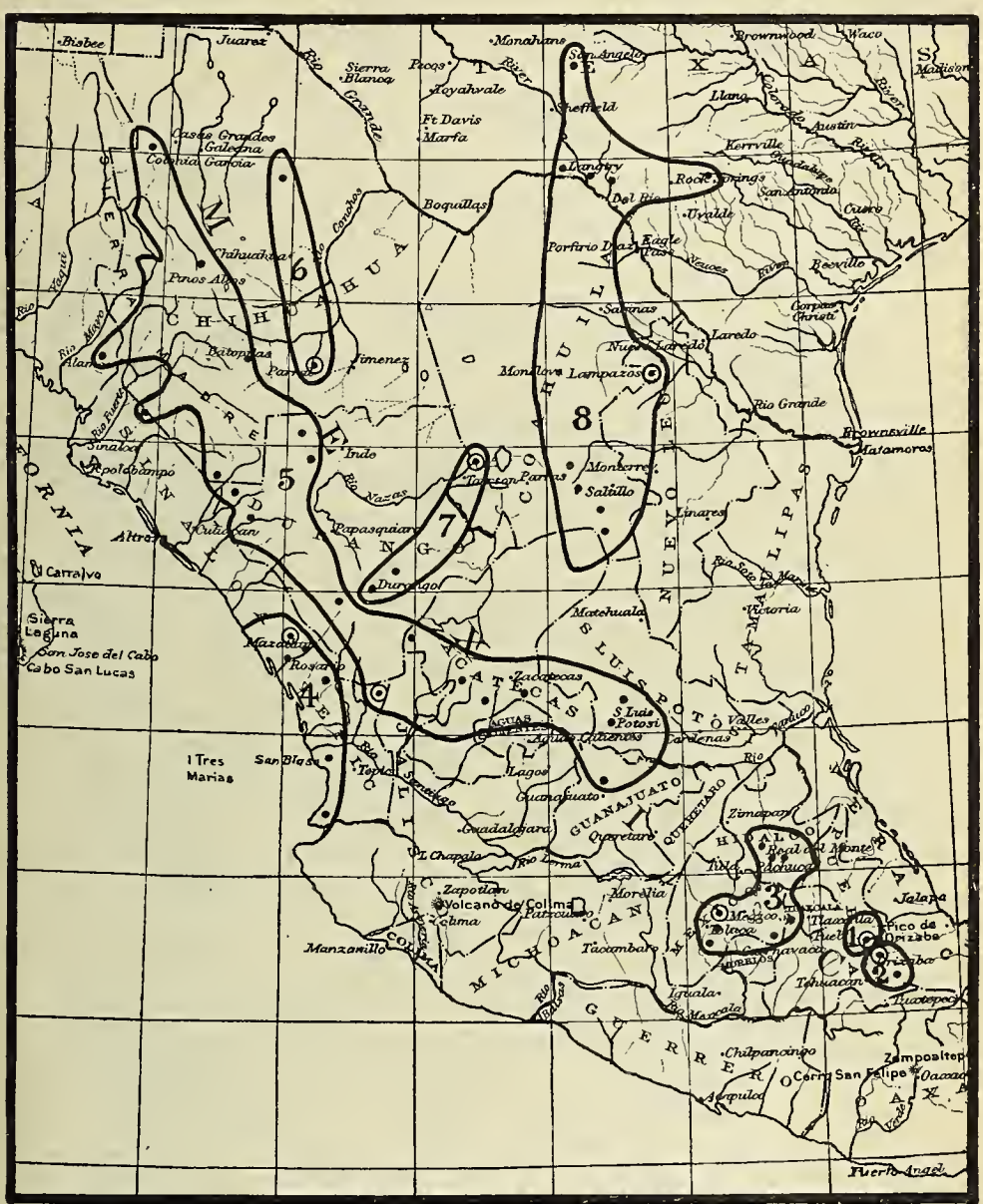
B2049-122

FIG. 8.—Map showing distribution of certain species and subspecies of *Thomomys*, and localities at which specimens were collected.

1. *fossor.*	4. *desertorum.*	7. *chrysonotus.*
2. *agrestis.*	5. *aureus.*	8. *cervinus.*
3. *pervagus.*	6. *latirostris.*	9. *intermedius.*

Wyo., where *T. bridgeri* is abundant in meadows and the little *T. ocius* in sagebrush only a few rods away; at Bear River, Wyo., where *T. pygmæus* holds the same relation to *T. bridgeri*; in western Nevada, where the small *T. fisheri* evidently keeps out in the sagebrush to avoid the big *T. nevadensis;* and in Idaho, where *T. townsendi* holds the rich bottoms and the little *T. idahoensis* the dry sagebrush borders. Where

T. monticola meets the various forms of the *bottæ* group along the west slope of the Sierra Nevada, and other species along the east slope of the range, the line of demarcation seems to be sharp, without actual overlapping of the species, although one form may lap well past the



B2050-122

FIG. 9.—Map showing distribution of certain species and subspecies of *Thomomys*, and localities at which specimens were collected.

1. *umbrinus*.
2. *orizabæ*.
3. *peregrinus*.
4. *atrovarius*.
5. *sheldoni*.
6. *nelsoni*.
7. *goldmani*.
8. *perditus*.

other in close juxtaposition, showing an apparent but not real overlapping of range. The two forms generally occupy different life zones, or different types of ground, or else divide the territory on

some other logical basis. This peculiarity of distribution is exemplified by many species and seems to be universal between the slender-

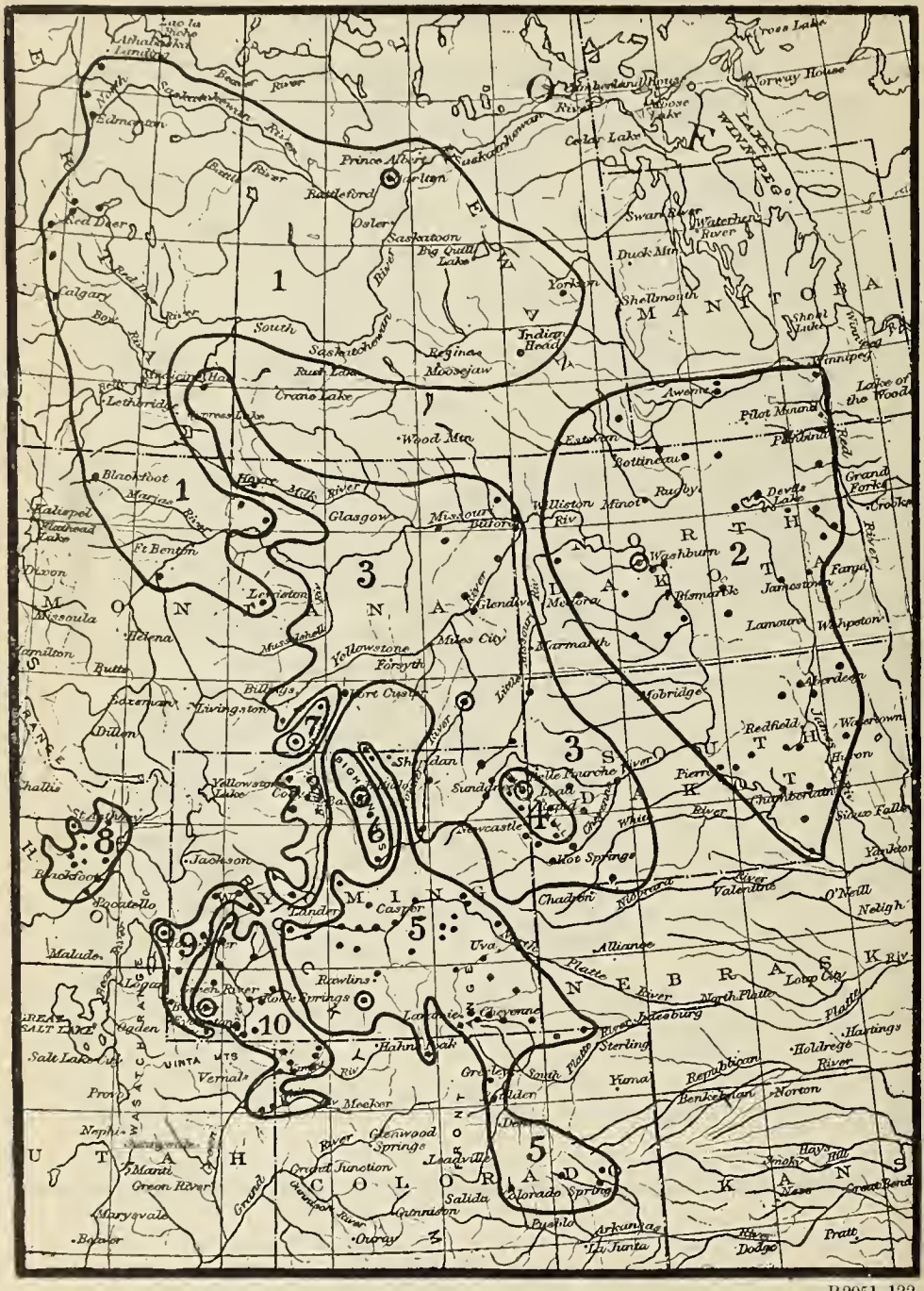


FIG. 10.—Map showing distribution of certain species and subspecies of *Thomomys*, and localities at which specimens were collected.

1. *talpoides.*
2. *rufescens.*
3. *bullatus.*
4. *nebulosus.*
5. *clusius.*
6. *caryi.*
7. *pryori.*
8. *idahoensis.*
9. *pygmæus.*
10. *ocius.*

and deep-rostrum groups. Further and more careful study, however, is needed to determine its cause.

The more nearly related forms generally intergrade or coalesce where their ranges join, some gradually, others abruptly, according to the change of physiographic or climatic conditions.

In Dr. Merriam's phylogenetic tree of the Geomyidæ,[1] *Thomomys* is given as one of the lower branches. The great numbers of genera and species of the family represented in southern Mexico and Central America are spoken of as of the utmost interest in view of the time and place of origin of the family to which they belong.[2] If, as seems probable, the family originated in tropical Mexico and Central America, *Thomomys* has pushed out to the greatest distance of any genus in the family and now reaches from Boca del Monte (near Orizaba), Vera Cruz, Mexico, north to Edmonton, Alberta, and from eastern North Dakota to the Pacific coast.

Over this vast region the species occupy every life zone from the Tropical to the Arctic Alpine, and the greatest extremes of heat and cold, dryness and humidity, light and shade to which the area is subject. Although living underground and being partially nocturnal in habits, the animals respond perfectly to environmental conditions and vary in color according to light and shade, in claws and incisor teeth according to soil texture, in length of fur according to temperature, and in size and form of ears in accordance with length of fur. Thus the great number of recognizable forms is a direct result of the wide distribution and adaptation of a plastic group. The temptation to theorize beyond the limits of actual knowledge in treating such a group is difficult to resist.

The boundaries of ranges of the recognized forms follow closely the border lines of known physiographic or climatic areas. Many forms occupy definite divisions of a life zone, or, in some cases, as on a mountain slope or on several different mountain slopes, extend regularly through a section of two or rarely three life zones, maintaining their boundary lines with surprising accuracy. On some steep and narrow mountain peaks or ranges, however, a valley species will extend up and down the sides through several climatic zones without undergoing noteworthy change.

Permanent residence in a given region seems necessary for noticeable change of characters, and even very restricted but very strongly characterized areas have developed well-marked forms. Species with the widest range are *T. talpoides* and *T. rufescens* of the great plains and prairies of the Saskatchewan and Dakota regions, or *T. fuscus* and *T. fossor* of the Canadian Zone areas of the Rocky Mountains. Some interior valley forms also have extensive ranges, but to the south and west, as the country becomes more broken and irregular, the recognizable forms of *Thomomys* become more numerous and local. California leads in the number of species, partly from its size and

[1] N. Am. Fauna No. 8, 24, 1895. [2] Ibid., 28.

great diversity of climatic and physical features and partly from the fact that it has been the most thoroughly studied of the Western States. The magnificent series of specimens in the Museum of Vertebrate Zoology of the University of California has not only added to the number of species known in the State, but has greatly helped in defining the ranges of local species and correlating them with the distribution areas.

MATERIAL EXAMINED.

In the present study of the genus *Thomomys* over 7,300 specimens have been examined. Of these, 4,166 are in the Biological Survey collection and 475 in the other collections of the National Museum. Of the remaining specimens examined, 1,755 are in the Museum of Vertebrate Zoology, 276 in the American Museum of Natural History, 234 in the Field Museum of Natural History, 177 in the Museum of Comparative Zoology, 131 in the Stanford University collection, 90 in the Academy of Natural Sciences of Philadelphia collection, and smaller numbers from the Victoria Memorial Museum, the Provincial Museum of British Columbia, the Kansas University collection, the Oregon Fish and Game Commission collection at Reed College, the California Academy of Sciences collection, the North Dakota Agricultural College Museum collection, and private collections of Mr. E. R. Warren, Mr. Stanley G. Jewett, Mr. W. D. Hollister, Dr. William Bebb, and Mr. Ernest Thompson Seton.

For the use of this material, which has in every case been most cordially loaned, my appreciation is elsewhere expressed.

All of the types now in America (83 in number) have been examined, and through the courtesy of Mr. Oldfield Thomas a good photograph of the skull of the type of *T. umbrinus* has been provided and also notes on the old types in the British Museum. Of the eight types not examined, five (*T. talpoides*, *T. umbrinus*, *T. atrovarius*, *T. alticola*, and *T. anitæ*) are in the collection of the British Museum. Good series of topotypes of all of these have been available for study, and also topotypes of *T. bulbivorus* and *T. douglasi*, the types of which appear to be no longer in existence. Unfortunately the type of *T. talpoides* is imperfect, lacking most of the skull, but a good series of virtual topotypes have been available for study.

The type of *T. bottæ* in the Museum d'Histoire Naturelle, at Paris, has not been seen, but large series of specimens from the type region have been examined.

The study of this material shows many localities where a few specimens would throw much light on the zonal distribution and relationships of species, and brings up many problems that can be settled only by careful field study and the collection of specimens at many

localities. The distribution maps show many wide areas in which no gophers have been collected and in which the resident species is still unidentified.

The character of the specimens has generally been such as to render the study most profitable. Well-made skins with cleaned skulls, in series sufficient to show variation due to sex, age, and abnormalities, have greatly simplified the task of classification. The skulls of a few specimens collected on early expeditions have been removed and cleaned and for the first time studied in relation to ample material. In this way errors in the former use of names have been corrected.

ACKNOWLEDGMENTS.

The greater part of the present revision was completed through a study of specimens in the Biological Survey collection, but without the additional material in other museums and private collections the results would have been very imperfect. The friendly assistance and cordial cooperation of the leading museums in the United States and Canada and of private collectors have done much toward making possible the results thus far obtained.

It is with great pleasure that I acknowledge my indebtedness to Dr. Joseph Grinnell, director of the Museum of Vertebrate Zoology, University of California; Mr. Gerrit S. Miller, jr., curator of mammals, United States National Museum; Dr. J. A. Allen, curator of mammals and birds, American Museum of Natural History; Mr. Charles B. Cory, curator of the Department of Zoology, Field Museum of Natural History; Mr. Samuel Henshaw, curator of mammals, Museum of Comparative Zoology; Dr. Witmer Stone, curator of the Academy of Natural Sciences of Philadelphia; and Prof. J. C. Branner, in charge of the biological collections at Stanford University; not only for the use of the large collections under their care, but for courtesies and assistance in working on the collections at these respective museums. For the use of specimens borrowed I am indebted to Mr. Francis Kermode, curator of the Provincial Museum, Victoria, British Columbia; Mr. P. A. Taverner, of the Victoria Memorial Museum, Ottawa, Ontario; Prof. C. D. Bunker, in charge of the collection of the Kansas University Museum; Prof. William B. Bell, of the North Dakota Agricultural College; Dr. B. W. Evermann, director of the Museum of the California Academy of Sciences; Mr. William L. Finley, of the Oregon Fish and Game Commission; and Prof. John F. Bovard, in charge of the University of Oregon Museum. To private collectors my thanks are especially due to Mr. E. R. Warren, Mr. Stanley G. Jewett, Dr. William Bebb, Mr. W. D. Hollister, and Mr. Ernest Thompson Seton.

Genus THOMOMYS Wied.

Thomomys Wied, Nova Acta Acad. Cæs. Leop.-Carol., XIX, pt. 1, 378, 1839. Type, *Thomomys rufescens* Wied.

GENERIC CHARACTERS.

Upper and lower molars with both anterior and posterior enamel plate always present. Upper incisors with plain, slightly rounded anterior surface, a minute groove near inner edge of each. In some species, notably *T. bulbivorus*, *T. leucodon*, and *T. umbrinus*, the groove is very obscure and can be detected only with a lens; in others, especially the *monticola* group, it is relatively deep, well defined, and readily seen with the naked eye. In species where the inner groove is obscure there is often a trace of a median line of depression along the front of the incisor, but it is a mere trace, difficult to detect and not sufficiently constant to serve as a diagnostic character. Fore feet relatively much slenderer and claws lighter than in other genera of the family, but claws long and well adapted to burrowing.

GROUP RELATIONSHIPS.

In the present paper the species are arranged so far as possible in accordance with their relationships. There are no superspecific divisions of sufficient value to be accorded subgeneric rank, but related species have characters in common which distinguish them as a group from other groups.

The lower outline of the rostrum is the strongest division character, and this, though slight, seems clearly to separate two great groups. In one group the rostrum is deep and heavy in side view, and its lower outline slopes rather evenly from the anterior base of the upper molars to near the base of the incisors. This group includes *T. bulbivorus*, *T. townsendi*, *T. bottæ*, *T. alpinus*, *T. perpallidus*, *T. fulvus*, *T. umbrinus*, and related species. In the other group the rostrum is relatively slender in side view and its lower outline is abruptly arched in front of the upper molars. This group includes *T. talpoides*, *T. fossor*, *T. douglasi*, *T. monticola*, *T. fuscus*, and related species. In the text this division falls on page 96, the slender-rostrum group beginning with *T. talpoides* and continuing to the end. The species of these two groups seem not to intergrade.

HEAVY ROSTRUM GROUPS.

In the heavy rostrum groups are seven divisions, not all of equal distinctness.

Thomomys bulbivorus stands by itself because of its concave pterygoids, small claws, and peculiar fur; but it is not very distant from the *bottæ* group with which it agrees in arrangement of mammæ in 4 pairs.

The *townsendi* group also stands close to the *bottæ* group, as shown by the number and arrangement of mammæ; projecting, obscurely grooved incisors; and short, wide skull.

The *bottæ* group is large, variable, and not sharply separated from the *perpallidus* and *fulvus* groups; all of them agree in number and arrangement of mammæ, short ears, and many other characters. All the forms except *T. magdalenæ* and *T. b. russeolus* are dark or light ochraceous, and it is doubtful whether these two pale forms may not really belong to the *perpallidus* group, with which they agree in distinctly grooved incisors.

The *alpinus* group includes long, narrow-skulled, dark-colored, rather large-eared forms from high up in separate mountain ranges. The mammæ are as in the *bottæ* group. The incisors are abruptly decurved and distinctly grooved.

The *perpallidus* group includes mainly pale desert forms with very small ears, but has no very distinctive group characters. The incisors are abruptly decurved and distinctly grooved.

The *fulvus* group includes several mountain forms of rather bright tawny shades, and paler tawny valley forms in the surrounding country. Some strongly resemble forms of the *umbrinus* group, but all have the mammæ in 4 pairs (2 of inguinal and 2 of pectoral). The incisors are slightly projecting in some species. All are distinctly grooved.

The *umbrinus* group is characterized by 3 pairs of mammæ (2 of inguinal and 1 of pectoral); by relatively short, wide skulls; by projecting, obscurely grooved incisors; and, in most species, by indented or straight anterior base of zygomata.

SLENDER ROSTRUM GROUPS.

In the slender rostrum groups are five subdivisions, none very strongly marked, but all with distinctly grooved incisors.

The *talpoides* group is best characterized by 6 pairs of mammæ (2 of inguinal, 2 of abdominal, and 2 of pectoral), by medium-sized ears, and by general gray coloration.

The *fossor* group is distinguished by 5 pairs of mammæ (2 pairs of inguinal and 3 of pectoral) and by generally brownish coloration. In the three mountain forms the ears are rather large, but in the two valley forms (*T. quadratus* and *T. fisheri*) the ears are very small.

The *douglasi* group and the two following are distinguished by 4 pairs of mammæ (2 of inguinal and 2 of pectoral).

The *monticola* group is very similar to the *douglasi* group, but has slightly larger and more pointed ears and generally more slender skulls.

The *fuscus* group is distinguished by very small, pointed ears and light brown color.

List of Species and Subspecies, with Type Localities.

Thomomys bulbivorus group (pp. 40–42):
- *Thomomys bulbivorus* (Richardson)..... Portland, Oreg.

Thomomys townsendi group (pp. 42–45):
- *Thomomys townsendi townsendi* (Bachman)..... Nampa, Idaho (?).
- *townsendi nevadensis* Merriam..... Austin, Nev.

Thomomys bottæ group (pp. 45–63):
- *Thomomys bottæ bottæ* (Eydoux & Gervais)..... "Coast of California."
- *bottæ laticeps* Baird..... Humboldt Bay, Cal.
- *bottæ leucodon* Merriam..... Grants Pass, Oreg.
- *bottæ navus* Merriam..... Red Bluff, Cal.
- *bottæ mewa* Merriam..... Raymond, Cal.
- *bottæ minor* Bailey..... Fort Bragg, Cal.
- *bottæ diaboli* Grinnell..... Diablo Range, Cal.
- *bottæ angularis* Merriam..... Los Banos, Cal.
- *bottæ pascalis* Merriam..... Fresno, Cal.
- *bottæ pallescens* Rhoads..... Grapeland, Cal.
- *bottæ infrapallidus* Grinnell..... Carrizo Plain, Cal.
- *bottæ nigricans* Rhoads..... Witch Creek, Cal.
- *bottæ puertæ* Grinnell..... La Puerta, Cal.
- *bottæ anitæ* Allen..... Santa Anita, Lower California.
- *bottæ alticolus* Allen..... Sierra Laguna, Lower California.
- *bottæ russeolus* Nelson & Goldman.. San Angel, Lower California.
- *magdalenæ* Nelson & Goldman..... Magdalena Island, Lower California.
- *altivallis* Rhoads..... San Bernardino Mountains, Cal.

Thomomys alpinus group (pp. 63–68):
- *Thomomys alpinus alpinus* Merriam..... Mount Whitney, Cal.
- *alpinus awahnee* Merriam..... Yosemite Valley, Cal.
- *neglectus* Bailey..... San Gabriel Mountains, Cal.
- *jacinteus* Grinnell & Swarth..... Round Valley, San Jacinto Mountains, Cal.
- *martirensis* Allen..... San Pedro Martir Mountains, Lower California.

Thomomys perpallidus group (pp. 68–80):
- *Thomomys perpallidus perpallidus* Merriam..... Palm Springs, Cal.
- *perpallidus albatus* Grinnell..... Near Pilot Knob, Cal.
- *perpallidus chrysonotus* Grinnell.... Ehrenburg, Ariz.
- *perpallidus perpes* Merriam..... Lone Pine, Cal.
- *perpallidus canus* Bailey..... Deep Hole, Nev.
- *perpallidus aureus* Allen..... Bluff, Utah.
- *perpallidus apache* Bailey..... Lake La Jara, N. Mex.
- *cabezonæ* Merriam..... Cabezon, Cal.
- *operarius* Merriam..... Keeler, Cal.
- *latirostris* Merriam..... Tanners Crossing of Little Colorado River, Ariz.
- *cervinus* Allen..... Phoenix, Ariz.
- *sinaloæ* Merriam..... Altata, Sinaloa, Mexico.

Thomomys fulvus group (pp. 80–89):
- *Thomomys fulvus fulvus* (Woodhouse)... San Francisco Mountains, Ariz.
- *fulvus pervagus* Merriam..... Espanola, N. Mex.
- *fulvus desertorum* Merriam..... Mud Spring, Detrital Valley, Ariz.
- *fulvus intermedius* Mearns..... Huachuca Mountains, Ariz.
- *fulvus texensis* Bailey..... Davis Mountains, Tex.
- *fulvus toltecus* Allen..... Colonia Juarez, Chihuahua, Mexico.
- *mearnsi* Bailey..... Animas Valley, N. Mex.
- *baileyi* Merriam..... Sierra Blanca, Tex.
- *lachuguilla* Bailey..... El Paso, Tex.

Thomomys umbrinus group (pp. 89–96):
- *Thomomys umbrinus umbrinus* (Richardson)..... Boca del Monte, Vera Cruz, Mexico (?).
- *umbrinus orizabæ* Merriam..... Mount Orizaba, Puebla, Mexico.
- *umbrinus peregrinus* Merriam..... Salazar, Mexico, Mexico.
- *nelsoni* Merriam..... Parral, Chihuahua, Mexico.
- *sheldoni* nobis..... Santa Teresa, Tepic, Mexico.
- *goldmani* Merriam..... Mapimi, Durango, Mexico.
- *perditus* Merriam..... Lampazos, Nuevo Leon, Mexico.
- *atrovarius* Allen..... Tatemales, Sinaloa, Mexico.

Thomomys talpoides group (pp. 96–110):
- *Thomomys talpoides talpoides* (Richardson)..... Fort Carlton, Saskatchewan, Canada.
- *talpoides rufescens* Wied..... Fort Clark, N. Dak.
- *talpoides clusius* Coues..... Bridgers Pass, Wyo.
- *talpoides bullatus* Bailey..... Powderville, Mont.
- *talpoides nebulosus* Bailey..... Sand Creek (Black Hills), Wyo.
- *talpoides caryi* Bailey..... Big Horn Mountains, Wyo.
- *talpoides pryori* Bailey..... Pryor Mountains, Mont.
- *talpoides agrestis* Merriam..... Medano Ranch, San Luis Valley, Colo.
- *columbianus* Bailey..... Touchet, Wash.
- *ocius* Merriam..... Fort Bridger, Wyo.
- *idahoensis* Merriam..... Birch Creek, Idaho.
- *pygmæus* Merriam..... Montpelier Creek, Idaho.

Thomomys fossor group (pp. 111–116):
- *Thomomys fossor* Allen..... Florida, Colo.
- *bridgeri* Merriam..... Fort Bridger, Wyo.
- *uinta* Merriam..... Uinta Mountains, Utah.
- *quadratus quadratus* Merriam..... The Dalles, Oreg.
- *quadratus fisheri* Merriam..... Beckwith, Cal.

Thomomys douglasi group (pp. 116–121):
- *Thomomys douglasi douglasi* (Richardson)..... Fort Vancouver, Wash.
- *douglasi oregonus* Merriam..... Oregon City, Oreg.
- *douglasi yelmensis* Merriam..... Tenino, Wash.
- *douglasi melanops* Merriam..... Olympic Mountains, Wash.
- *limosus* Merriam..... White Salmon, Wash.
- *niger* Merriam..... Seaton, Oreg.

Thomomys monticola group (pp. 121–126):
- *Thomomys monticola monticola* Allen.. Mount Tallac, Cal.
- *monticola mazama* Merriam..... Anna Creek, near Crater Lake, Oreg.
- *monticola pinetorum* Merriam..... Sisson, Cal.
- *monticola nasicus* Merriam..... Farewell Bend, Deschutes River, Oreg.
- *monticola helleri* Elliot..... Goldbeach, Oreg.

Thomomys fuscus group (pp. 126–131):

Thomomys fuscus fuscus Merriam	Head of Big Lost River, Idaho.
fuscus saturatus Bailey	Silver (near Saltese), Mont.
fuscus loringi Bailey	South Edmonton, Alberta, Canada.
fuscus myops Merriam	Conconully, Wash.
hesperus Merriam	Tillamook, Oreg.

Key to Groups of Related Species.

a^1. Rostrum deep and evenly sloping in front of upper molars.
  b^1. Pterygoids concave on inner surface and convex on outer; mammæ in 4 pairs, **bulbivorus** group (p. 40).
  b^2. Pterygoids flat and straight.
    c^1. Mammæ in 3 pairs (inguinal, 2–2; pectoral, 1–1)..... **umbrinus** group (p. 89).
    c^2. Mammæ in 4 pairs (inguinal, 2–2; pectoral, 2–2).
      d^1. Skull short and wide; color mainly dark or light ochraceous, **bottæ** group (p. 45).
      d^2. Skull not conspicuously short and wide.
        e^1. Skull long and narrow; color dark..... **alpinus** group (p. 63).
        e^2. Skull not conspicuously long and narrow; color mainly pale.
          f^1. Color pale buffy yellowish, or gray and black.
            g^1. Color buffy or yellowish (except *apache*)... **perpallidus** group (p. 68).
            g^2. Color gray and black..... **townsendi** group (p. 42).
          f^2. Color tawny (light or dark tawny)..... **fulvus** group (p. 80).
a^2. Rostrum slender, abruptly arched in front of upper molars.
  b^1. Mammæ in 6 pairs or more (inguinal, 2–2; abdominal, 2–2; pectoral, 2–2), **talpoides** group (p. 96).
  b^2. Mammæ in 4 or 5 pairs.
    c^1. Mammæ in 5 pairs (inguinal, 2–2; pectoral, 3–3)..... **fossor** group (p. 111).
    c^2. Mammæ in 4 pairs (inguinal, 2–2; pectoral, 2–2).
      d^1. Ears rather large and rounded at tips..... **douglasi** group (p. 116).
      d^2. Ears large or small and pointed at tips.
        e^1. Ears relatively large and pointed..... **monticola** group (p. 121).
        e^2. Ears relatively small and pointed..... **fuscus** group (p. 126).

Key to Species and Subspecies of Thomomys.

[Measurements in millimeters.]

a^1. Size large; hind foot of ♂ 38 or more.
  b^1. Color uniformly dark sooty brown above and below; hind foot of ♂ 40 or more, **bulbivorus** (p. 40).
  b^2. Color gray or black (dichromatic); hind foot of ♂ 38, of ♀ 35.
    c^1. Color in gray phase dark buffy gray ..... **townsendi** (p. 42).
    c^2. Color in gray phase light buffy gray ..... **nevadensis** (p. 44).
a^2. Size medium or small.
  b^1. Size very small, hind foot of ♂ averaging 26 or less; color buffy gray or brown.
    c^1. Color buffy gray.
      d^1. Hind foot of ♂ averaging 26..... **ocius** (p. 107).
      d^2. Hind foot of ♂ averaging 23..... **idahoensis** (p. 108).
    c^2. Color light brown.
      d^1. Hind foot of ♂ averaging 25..... **myops** (p. 130).
      d^2. Hind foot of ♂ averaging 22 (smallest of the genus)..... **pygmæus** (p. 109).

b^2. Size medium, hind foot of ♂ averaging over 26 and under 36.
c^1. Color brown, mainly cinnamon-hazel, chestnut, or russet.
d^1. Color dark and rich browns.
e^1. No conspicuous black on nose and face; hind foot of ♂ about 30, **limosus** (p. 120).
e^2. Much blackish on nose and face.
f^1. Size smaller, hind foot of ♂ about 27 ..... **hesperus** (p. 131).
f^2. Size larger, hind foot of ♂ about 29.
g^1. Skull with very small oval interparietal ..... **melanops** (p. 119).
g^2. Skull with large triangular interparietal ..... **helleri** (p. 126).
d^2. Color light, or bright or dull browns.
e^1. Ears small but pointed and well formed.
f^1. Color light brown; hind foot of ♂ about 27.
g^1. Slightly paler; molars lighter ..... **fuscus** (p. 126).
g^2. Slightly darker; molars heavier ..... **loringi** (p. 129).
f^2. Color duller and darker shades of brown; size larger.
g^1. Skull very long and narrow; hind foot of ♂ about 29. **saturatus** (p. 128).
g^2. Skull relatively short and wide.
h^1. Incisors projecting beyond tip of nasals; hind foot of ♂ 29, **pryori** (p. 104).
h^2. Incisors not projecting beyond tip of nasals.
i^1. Nasals truncate at posterior tip; hind foot of ♂ 27, **quadratus** (p. 114).
i^2. Nasals emarginate at posterior tip; hind foot of ♂ 28, **caryi** (p. 104).
e^2. Ears relatively long and pointed.
f^1. Color dull brown.
g^1. Size larger, hind foot of ♂ averaging 33 ..... **bridgeri** (p. 112).
g^2. Size smaller, hind foot of ♂ under 33.
h^1. Bullæ large; posterior tip of nasals rounded ..... **fossor** (p. 111).
h^2. Bullæ smaller; posterior tip of nasals emarginate .... **uinta** (p. 113).
f^2. Color bright, warm browns.
g^1. Size larger, hind foot of male averaging about 30.
h^1. Skull relatively short and wide; interparietal triangular, **oregonus** (p. 117).
h^2. Skull long and narrow; interparietal small and oval.
i^1. Zygomatic arches widest anteriorly ..... **douglasi** (p. 116).
i^2. Zygomatic arches widest posteriorly ..... **yelmensis** (p. 118).
g^2. Size smaller, hind foot of ♂ about 28 or less.
h^1. Color russet; bullæ full and rounded ..... **mazama** (p. 123).
h^2. Color hazel; bullæ relatively small and angular.
i^1. Color dull hazel; braincase very narrow ..... **monticola** (p. 121).
i^2. Color more yellowish hazel; braincase wider.
j^1. Nasals longer and conspicuously widened anteriorly, **nasicus** (p. 125).
j^2. Nasals shorter and merely cuneate ..... **pinetorum** (p. 124).
c^2. Color not distinctly brown, but of various shades of ochraceous, tawny, buff, gray, umber, or black.
d^1. Color strongly ochraceous.
e^1. Incisors projecting conspicuously beyond tip of nasals.
f^1. Color dark ochraceous, clouded with dusky in winter.
g^1. Size large, hind foot of ♂ averaging 33 ..... **bottæ** (p. 45).
g^2. Size smaller, hind foot of ♂ not over 30.
h^1. Color darker than in *bottæ* ..... **minor** (p. 51).
h^2. Color lighter than in *bottæ* ..... **diaboli** (p. 51).

f^2. Color light, bright, or rusty ochraceous.
g^1. Color light or bright ochraceous.
h^1. Color bright ochraceous; skull heavy and angular, **angularis** (p. 53).
h^2. Color pale ochraceous; skull not heavy and angular, **infrapallidus** (p. 55).
g^2. Color rusty ochraceous.
h^1. Incisors heavy and not greatly projecting. . . . . **laticeps** (p. 46).
h^2. Incisors slender and greatly projecting.
i^1. Hind foot of ♂ 30 to 33. . . . . **leucodon** (p. 47).
i^2. Hind foot of ♂ 27 to 30. . . . . **navus** (p. 49).
e^2. Incisors not projecting conspicuously beyond tip of nasals.
f^1. Color light ochraceous.
g^1. Size large, hind foot of ♂ averaging about 32.
h^1. Bullæ large; skull short and wide. . . . . **pascalis** (p. 54).
h^2. Bullæ small; skull long and narrow. . . . . **pallescens** (p. 55).
g^2. Size smaller, hind foot of ♂ averaging 30 or less.
h^1. Underparts buffy or whitish. . . . . **cabezonæ** (p. 76).
h^2. Underparts light ochraceous. . . . . **puertæ** (p. 58).
f^2. Color dark ochraceous, or ochraceous heavily clouded with black.
g^1. Size large, hind foot averaging 34. . . . . **altivallis** (p. 62).
g^2. Size medium or small.
h^1. Size small, hind foot of ♂ about 27.
i^1. Skull narrow. . . . . **awahnee** (p. 64).
i^2. Skull wide. . . . . **mewa** (p. 50).
h^2. Size medium, hind foot of ♂ averaging 30–32.
i^1. Dorsal outline of skull arched, rostrum decurved.
j^1. Interpterygoid fossa wide, not sharply V-shaped, **apache** (p. 75).
j^2. Interpterygoid fossa narrow, sharply V-shaped.
k^1. Throat usually white, interparietal large and quadrate, **alpinus** (p. 63).
k^2. Throat rarely white, interparietal small and often triangular.
l^1. Premaxillæ wide. . . . . **alticolus** (p. 60).
l^2. Premaxillæ narrow.
m^1. Skull very long and narrow. . . . . **martirensis** (p. 67).
m^2. Skull not very long and narrow. . . . . **nigricans** (p. 56).
i^2. Dorsal outline of skull straight, rostrum not decurved.
j^1. Zygomatic arches widest posterior to middle; nasals emarginate, **neglectus** (p. 65).
j^2. Zygomatic arches widest anterior to middle; nasals usually truncate. . . . . **jacinteus** (p. 66).
d^2. Color not strongly ochraceous.
e^1. Color tawny, varying from dark to bright and pale tawny.
f^1. Size large, hind foot of ♂ averaging 31 or more.
g^1. Color bright tawny.
h^1. Tail, feet, and belly well haired. . . . . **pervagus** (p. 82).
h^2. Tail, feet, and belly very thinly haired.
i^1. Skull short and wide. . . . . **sinaloæ** (p. 80).
i^2. Skull long and relatively narrow. . . . . **anitæ** (p. 59).
g^2. Color dull tawny, bordering on buffy and fawn.
h^1. Hind foot of ♂ averaging 34 or more. . . . . **cervinus** (p. 79).
h^2. Hind foot of ♂ averaging about 31 or less.
i^1. Color dull tawny. . . . . **toltecus** (p. 86).
i^2. Color yellowish tawny. . . . . **baileyi** (p. 87).

f^2. Size smaller, hind foot averaging 30 or less.
g^1. Color dark tawny, clouded with black in winter pelage.
h^1. Hind foot of ♂ about 30.....**fulvus** (p. 80).
h^2. Hind foot of ♂ about 27.
i^1. Color dark, bordering on umber.....**intermedius** (p. 84).
i^2. Color brighter with less black on back.....**texensis** (p. 85).
g^2. Color bright or pale tawny.
h^1. Color very bright tawny.
i^1. Incisors not conspicuously protruding beyond nasals, **desertorum** (p. 83).
i^2. Incisors conspicuously protruding beyond nasals.
j^1. Belly pale tawny.....**nelsoni** (p. 92).
j^2. Belly white or yellow.
k^1. Belly white.....**goldmani** (p. 94).
k^2. Belly yellow.....**mearnsi** (p. 87).
h^2. Color pale tawny.
i^1. Color brighter, more buffy tawny.....**lachuguilla** (p. 88).
i^2. Color duller, more grayish tawny.....**perditus** (p. 95).
e^2. Color not tawny.
f^1. Color buff or orange, varying from light buff to rich orange-buff.
g^1. Color bright orange-buff or buffy yellow.
h^1. Size large, hind foot of type (♂ ad.) 36.....**magdalenæ** (p. 61).
h^2. Size smaller, hind foot not over 33.
i^1. Zygomatic arches abruptly constricted posteriorly, **operarius** (p. 77).
i^2. Zygomatic arches not abruptly constricted posteriorly.
j^1. Rostrum very broad.....**latirostris** (p. 78).
j^2. Rostrum less broad.....**aureus** (p. 74).
g^2. Color buff or grayish buff.
h^1. Color grayish buff.
i^1. Size large, hind foot of ♂ about 33.....**canus** (p. 73).
i^2. Size smaller, hind foot of ♂ about 30.....**perpes** (p. 72).
h^2. Color clear yellowish buff.
i^1. Size large, hind foot of ♂ averaging 34.....**albatus** (p. 70).
i^2. Size smaller, hind foot of ♂ about 30.
j^1. Nasals conspicuously truncate posteriorly.....**russeolus** (p. 60).
j^2. Nasals usually slightly emarginate posteriorly.
k^1. Skull narrow and slender.....**perpallidus** (p. 68).
k^2. Skull short and wide.....**chrysonotus** (p. 71).
f^2. Color not buff or orange.
g^1. Color gray, varying from light to dark brownish gray.
h^1. Color dark brownish gray; claws stout; ears larger.
i^1. Audital bullæ long but not full and rounded.
j^1. Skull not heavily ridged in old ♂, hind foot about 30, **talpoides** (p. 96).
j^2. Skull heavily ridged in old ♂, hind foot about 31, **rufescens** (p. 98).
i^2. Audital bullæ full and rounded.
j^1. Color lighter, bullæ larger.....**bullatus** (p. 102).
j^2. Color darker, bullæ smaller.....**nebulosus** (p. 103).
h^2. Color light brownish gray or pale gray; claws slender; ears smaller.
i^1. Audital bullæ large and globose.
j^1. Color very pale gray.....**agrestis** (p. 105).
j^2. Color not so pale gray.....**clusius** (p. 100).

f^2. Audital bullæ relatively narrower.
j^1. Size larger, hind foot of ♂ about 28....columbianus (p. 106).
j^2. Size smaller, hind foot of ♂ about 26 .....fisheri (p. 115).
g^2. Color not gray, but dark or light umber or black.
h^1. Incisors abruptly decurved, inner groove conspicuous; color always black.....niger (p. 121).
h^2. Incisors conspicuously projecting beyond nasals, inner groove very obscure; color not always black.
i^1. Color generally black (dark umber in a few individuals), orizabæ (p. 90).
i^2. Color dark or light umber (black in a few individuals).
j^1. Color dark umber.
k^1. Feet, tail, and belly almost naked.....atrovarius (p. 95).
k^2. Feet, tail, and belly with normal covering of hair.
l^1. Skull very short and wide; color very dark, umbrinus (p. 89).
l^2. Skull less short and wide; color bright..peregrinus (p. 91).
j^2. Color light umber .....sheldoni (p. 93).

Description and Distribution of Species and Subspecies.

Thomomys bulbivorus Group.

THOMOMYS BULBIVORUS (Richardson).

Camas Pocket Gopher (Camas Rat of Richardson).

(Pl. II, fig. 1; Pl. III, fig. 1.)

Diplostoma bulbivorum Richardson, Fauna Boreali-Americana, I, 206, 1829.
Geomys bulbivorus Richardson, Ann. Rept. Brit. Assn. for 1836, VI, 150, 1837.
Ascomys bulbivorus Wagner, Suppl. Schreber, III, 388, 1843.
Pseudostoma bulbivorum Audubon & Bachman, Quad. N. Am., III, 337, 1854.
Geomys (Thomomys) bulbivorus Giebel, Säug. 530, 1855.
Thomomys bulbivorus Brandt, Beit. Kennt. Säug. Russl., 188, 1855.—Allen, Bul. Am. Mus. Nat. Hist., V, 56, April 28, 1893.—Miller, Proc. Biol. Soc. Washington, VIII, 113, Aug. 6, 1893.
Thomomys [sub-genus *Megascapheus*] *bulbivorus* Elliot, Field Columbian Mus., zool. ser. III, 190, May, 1903.

Type.—Collected on "Banks of the Columbia River, Oregon," probably Portland, the only place near the Columbia River where it has since been taken. The type is said to have been in the Hudson Bay Museum, but Oldfield Thomas writes (Mar. 15, 1915) that it is not now in the British Museum collection.

Distribution.—Willamette Valley, Oreg., from Portland and Forest Grove south to Eugene; west to Grand Ronde (fig. 5).

Characters.—Largest known species of the genus; hind foot of adult male 40–43 mm.; front claws small and weak; external ear merely a thickened rim; tail almost naked; winter coat long and furry; summer coat short and harsh; color dark brown or sooty, nearly concolor above and below; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2, with 4 separate mammary glands.

Color.— *Winter pelage:* Dark sooty brown, the plumbeous basal color showing through on belly; ears and nose blackish; chin and throat and usually small anal patch white; feet usually streaked or mottled with white. *Summer pelage:* Washed with rusty brown above and below. *Young:* Like summer adults but very thinly haired, the skin showing through on belly.

Skull.—Short and wide with zygomatic arches usually widest posteriorly; rostrum, slender; nasals short, falling considerably short of premaxillæ at both ends; pterygoids convexly inflated and divided by narrow fossa; bullæ rather small and narrow but auditory meatus unusually open or dilated. *Dentition* rather light; incisors slender, greatly protruding, and usually white tipped; groove on inner edge of upper incisors very obscure.

Measurements.—Average of 5 adult males from Salem and Beaverton, Oreg.: Total length, 300; tail vertebræ, 90; hind foot, 42. Largest male: 302, 99, 43. Average of 4 adult females: 271, 81, 39. *Skull* (♂ ad.):[1] Basal length, 52; greatest length over incisors, 57; nasals, 19; zygomatic breadth, 36.5; mastoid breadth, 30.5; alveolar length of upper molar series, 10.

Remarks.—This is the most aberrant form of the genus, marking either an ancestral type or more probably a highly specialized development of adaptive characters. Widely separated geographically from the *bottæ* group, with which it shows the closest affinities, it is entirely isolated in the humid, rich-soiled valley of the Willamette.

The object of the projecting incisors becomes evident when these gophers are trapped. During the dry season the soil of the Willamette Valley becomes baked and so hard that digging open gopher holes with a small shovel, knife, or sharp stick is difficult, and but for a granular cleavage would be almost impossible. The adobe earth breaks out somewhat as the segments of a pomegranate, but in coarser granules. Evidently the little irregular clay balls making up the gopher hills are pried out with the projecting incisors, which by long use have become perfect miners' picks. The upper incisors project actually beyond the tip of the gopher's nose and at a convenient angle for prying out the earth balls. The lower incisors project equally far but from farther back. The fur-lined lips close behind the incisors, so that no earth can get into the mouth. The short bristly fur surrounding the base of the incisors protects the lips, and leaves the "pick and shovel" teeth free. That the teeth are regularly used for digging is evidenced by the much-worn tips and edges. The white tips are shown by the lens to be due to the wearing away of the yellow enamel surface. The slight inner groove is usually worn entirely away before it reaches the tip of the incisor. It seems

[1] No. 57322, U. S. Nat. Mus., from Salem, Oreg.

highly probable that the unusually weak front claws of this gopher result from their disuse in heavier kinds of digging.

The subgeneric characters ascribed to this species consist of little more than the convex wings of the pterygoids. While this character is unique in the genus it involves only the form of a weak and variable bone and seems too superficial for more than specific value. As there are no other divisions of subgeneric rank in the genus this one seems of doubtful value.

The large mounds of these gophers have been observed in Oregon at Albany, Cottage Grove, Harris, Lyons, and almost continuously along the roads from Salem to a little south and 12 miles east of Eugene.

Specimens examined.—Total number, 62, as follows:

Oregon: Beaverton, 12; Corvallis, 1; Eugene, 8; Gaston, 2; Grand Ronde, 3; McCoy, 6; Mulino, 6; Portland, 5; Salem, 20; Sheridan, 2.

Thomomys townsendi Group.

THOMOMYS TOWNSENDI TOWNSENDI (Bachman).

Townsend Pocket Gopher.

(Pl. II, fig. 2; Pl. III, fig. 2.)

Geomys townsendii Bachman (from Richardson's MS.), Journ. Acad. Nat. Sci. Philadelphia, VIII, pt. 1, 105, 1839.

Thomomys nevadensis atrogriseus Bailey, Proc. Biol. Soc. Washington, XXVII, 118, July 10, 1914. Type locality, Nampa, Idaho.

Type.—Type locality erroneously given as "Columbia River," but probably southern Idaho and very probably near Nampa, where Townsend's party camped to trade with Indians, August 22, 1834. Type specimen in Acad. Nat. Sci. Philadelphia.

Distribution.—Valley of Snake River in southern Idaho, from American Falls to Weiser (fig. 5).

Characters.—Size very large; ears small but pointed; claws medium; mammæ 4 pairs, inguinal, 2–2, pectoral 2–2; color dichromatic, a dark gray phase and a black phase; skull relatively wide and angular.

Color.—In gray phase: Upperparts dark buffy gray or sooty gray; nose and face blackish; ear patch black; feet and tail soiled gray; underparts washed with rich buff; cheek pouches lined with black and white; chin white. In black phase: Dull, slaty black all over except white patch on chin and toes and usually on lower part of feet. There seems to be little seasonal variation except for a general darkening with wear as the buff tips disappear from the hairs. Two specimens from Caldwell, Idaho, collected May 30 and June 3, are clearer, richer buff than any others and much darker and richer even than any specimens of the subspecies *nevadensis*. This may be a normal but rare pelage.

Skull.—Large and wide with spreading zygomatic arches, narrow nasals and rostrum, and short, wide braincase; sagittal and occipital crests well developed in old males; audital bullæ large but depressed to level of basioccipital, rather angular; basioccipital thick and narrow; pterygoids high but short and thickened at margins. *Dentition* heavy; incisors long and slightly projecting; inner groove obscure.

Measurements.—Adult male: Total length, 305; tail vertebræ, 100; hind foot, 38. Adult female: 276, 75, 35. These are about average measurements. *Skull* (♂ ad.): Basal length, 49; nasals, 18; zygomatic breadth, 35; mastoid breath, 29; interorbital breadth, 8; alveolar length of upper molar series, 10.

Remarks.—The type of Bachman's *Geomys townsendii* which evidently was labeled, not by the collector but after it came into the possession of the Academy of Natural Sciences of Philadelphia, "Rocky Mts., J. K. Townsend," is fortunately still extant. Bachman published Richardson's manuscript description of the species in 1839, and stated that it came from the Columbia River. It was a mounted specimen with the skull inside, and its identity has caused much speculation. Through the kindness of Dr. Witmer Stone, of the Academy of Natural Sciences, the type is now before me and the skull has been removed and cleaned. The type is an immature female and much faded, but the skull serves to identify the species at once as one which I recently described under the name *atrogriseus* from southern Idaho. I take pleasure in yielding my recent name in favor of one which for 76 years has been misapplied. In 1834, J. K. Townsend made his journey to the coast of Oregon through southern Idaho, and very probably secured the type of the species named for him near the present town of Nampa, where his party camped August 22 to trade with the Indians.[1] The type locality of *Thomomys townsendi* may therefore be fixed as the vicinity of Nampa, where these large gophers still abound and from which place we have a fine series of specimens.

My *atrogriseus* was described as a subspecies of *nevadensis*, but now *nevadensis* becomes a subspecies of *townsendi* since the latter is the earlier name. The nearest relationships are with the *bottæ* and *perpallidus* groups, but there is probably no direct connection with either at the present time.

Specimens examined.—Total number, 63, as follows:

Idaho: American Falls, 10; Caldwell, 2; Nampa, 19; Payette, 14; Weiser, 4.
Oregon: Ontario, 2; Owyhee, 6; Vale, 6.

[1] Townsend, J. K., Narrative of a Journey Across the Rocky Mountains to the Columbia River, 136, 1839.

THOMOMYS TOWNSENDI NEVADENSIS Merriam.

Nevada Pocket Gopher.

(Pl. III, fig. 3.)

Thomomys nevadensis Merriam, Proc. Biol. Soc. Washington, XI, 213, 1897.

Type.—Collected at Austin, Nevada (exact locality, bottom of valley about 5 miles west of the town in moist soil near Reese River) by Vernon Bailey, November 11, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Valleys of central and northern Nevada and southeastern Oregon, from Austin and Lovelocks, Nev., north to Alvord Lake, Oreg. (fig. 5).

Characters.—Size large; hind foot 35–40 mm.; skull heavily ridged and angular with projecting incisors; colors dichromatic, buffy gray, or black; in the gray phase more buffy and in the black phase more plumbeous than in *townsendi;* mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—In gray phase: Light buffy gray, slightly paler on belly, feet, and tail; nose and cheeks plumbeous; throat white. In black phase: Bluish black or plumbeous all over except white throat and usually white feet. There is often a small white spot on top of head and the white throat patch extends to breast on some specimens. Intermediate specimens are bluish gray or mixed gray and plumbeous.

Skull.—Heavy and angular with long nasals and rostrum; lateral ridges joined in sagittal crest in old males; zygomatic arches wide spreading with slight median constriction; bullæ large but depressed to plane of basioccipital and with sharp anterior points; basioccipital narrowed between bullæ; pterygoids high, thin, and arched. *Dentition* heavy; incisors slightly projecting; inner groove obscure.

Measurements.—Type (♂ ad.): Total length, 275; tail vertebræ, 90; hind foot, 38. Topotype (♀ ad.): 255, 82, 35. *Skull* (of type): Basal length, 44; nasals, 15.5; zygomatic breadth, 31; mastoid breadth, 26; alveolar length of upper molar series, 9.

Remarks.—None of the type series are in the black phase, but in a series of 15 from Battle Mountain 7 are black, 5 are gray, and 3 are intermediate. Other melanistic specimens come from Halleck, Argenta, Winnemucca, and McDermitt, Nev., and Lake Alvord, Oreg. Like *townsendi*, this gopher inhabits moist fertile valley bottoms and not the surrounding dry sagebrush land. Its range therefore is along stream valleys, and while its close relationship with *townsendi* indicates only subspecific rank, its range is apparently at present not continuous with that form. On the west it is cut off from its next nearest relative—*griseus*—by the Sink of the Humboldt and its desert margins.

Specimens examined.—Total number, 93, as follows:

Nevada: Argenta, 1; Austin, 9; Battle Mountain, 15; Big Creek, 3; Halleck, 5; Independence Valley, 1; Lovelocks, 10; McDermitt, 2; Paradise, 8; Quinn River Crossing, 14; Winnemucca, 7.

Oregon: Alvord, 1; Alvord Lake, 10; Tumtum Lake, 7.

Thomomys bottæ Group.

THOMOMYS BOTTÆ BOTTÆ (Eydoux & Gervais).

California Pocket Gopher.

(Pl. II, fig. 3; Pl. III, fig. 4; text fig. 2.)

Oryctomys (*Saccophorus*) *bottæ* Eydoux & Gervais, Mag. de Zool., VI, 23–24, pl. 21, fig. 4, 1836.

Thomomys bottæ Baird, Proc. Acad. Nat. Sci. Philadelphia, VII, 335, 1855.

Thomomys bulbivorus Baird, Mamm. N. Am., 389, 1857. Not *Diplostoma bulbivorum* Richardson.

Type.—Collected on "coast of California," probably at Monterey or San Francisco. Type in "Collection de la Faculté des Sciences," Paris.

Distribution.—Coast region of California, from Sonoma County (Freestone) south to San Diego (fig. 6).

Characters.—Size large, males much larger than females; average of hind foot in males, 33 mm., in females, 28 mm; ears short, a mere thickened rim; color dull, dark yellowish brown, nearly unicolor; skull well arched, heavily ridged, and angular, with slightly projecting incisors; grooves on inner edge of incisors very small; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color— Winter pelage: Upperparts dark ochraceous, heavily clouded with black-tipped hairs; underparts lightly washed with dull ochraceous over the plumbeous underfur, often almost as dark as upperparts; ear patch, nose, and cheeks blackish; lips and lining of pockets white; tail usually dusky or brownish gray; feet usually white. *Summer pelage:* Very similar, but slightly brighter, clearer ochraceous.

Skull.—Adult male: Heavy and angular with long, decurved rostrum; lateral ridges occasionally meeting in very old age in sagittal crest; nasals long, cuneate or slightly spatulate, narrow, and generally emarginate posteriorly; auditory meatus large and slightly inflated; bullæ rather depressed and angular; upper incisors projecting slightly beyond tip of nasals. Adult female: Much smaller, slenderer, and less ridged than in males, but with the same arched outline, slender rostrum, and projecting incisors.

Measurements.—Average of 5 adult males from near Monterey: Total length, 267; tail vertebræ, 81; hind foot, 33. Average of 5 females: 219, 69, 28. *Skull* (♂ ad.):[1] Basal length, 45; nasals, 16.5; zygo-

[1] No. 107856, U. S. Nat. Mus., from near Monterey, Cal.

matic breadth, 29; mastoid breadth, 24; alveolar length of upper molar series, 9. Skull of adult female (from same locality): 36, 13, 24, 19, 8.7.

Remarks.—In addition to the unusual discrepancy in size of males and females of *bottæ* there is a great range of local variation in specimens from widely separated localities. To the south this subspecies passes into *pallescens;* to the north it intergrades with *minor* and apparently with *leucodon;* to the east it grades into the larger bright-colored *angularis* of the San Joaquin Valley; and along the eastern side of the valley it runs into the paler *pascalis.* But in the coast region it is fairly typical from Bodega on the north to San Diego on the south.

Specimens examined.—Total number, 713, as follows:

California (western): Alameda, 1; Alhambra, 4; Arroyo Seco (Monterey County), 7; Banta, 7; Bear Valley (head of Carmel River), 2; Berkeley, 18; Big Pine Mountains, 2; Bodega, 11; Carmel River, 1; Carmel Valley, 5; Carpenteria, 2; Colma, 1; Cone Peak, 1; Cuyama Valley (Schoolhouse Canyon), 6; Drum Barracks (Los Angeles County), 2; Freestone, 12; Gaviota Pass, 3; Glendora; 6; Half Moon Bay, 1; Haywards, 14; Hernandez (San Benito County), 1, Hueneme, 5; Inverness, 28; Jamesburg, 13; Jolon, 10; Laguna Ranch, 6; Lagunitas, 1; La Honda, 5; Las Virgines Creek, 6; Little Pine Canyon, 1; Los Angeles, 14; Los Gatos, 1; Mansfield, 5; Matilija (Ventura County), 9; Milpitas Ranch (south base Santa Lucia Peak), 1; Mono Flats, 9; Monrovia, 1; Monterey (Pacific Grove and Point Pinos), 34; Morro, 2; Mount Tamalpais, 1; Mountain View (Santa Clara County), 1; Nicasio, 84; Oakland, 1; Olema, 1; Pacific Grove, 1; Palo Alto, 44; Palos Colorados Canyon, 2; Pasadena and vicinity, 22; Pescadero, 7; Pine Creek (Bailey's Ranch), 2; Pine Valley (Monterey County), 7; Petaluma, 6; Pleyto, 6; Point Reyes, 18; Point Sur, 6; Portolo (San Mateo County), 8; Posts, 11; Pozo, 2; Priest Valley, 9; Redwood City, 27; Salinas Valley, 4; San Diego, 8; San Francisco (Golden Gate), 9; San Jose, 2; San Lorenzo, 1; San Mateo, 2; San Simeon, 2; Santa Ana Canyon, 4; Santa Barbara, 1; Santa Clara County, 6; Santa Cruz, 6; Santa Cruz Mountains, 1; Santa Inez, 2; Santa Margarita (San Luis Obispo County), 1; Santa Monica, 3; Santa Paula, 1; Soquel (Santa Cruz County), 2; Stanford, 48; Stanford University, 7; Stony Creek (Monterey County), 1; Sur River, 1; Tassajara Spring (Contra Costa County), 2; Tomales, 18; Tracy and vicinity, 25; Twin Oaks, 13; Union Island, 1; Ventura, 5; Walnut Creek, 16.

THOMOMYS BOTTÆ LATICEPS Baird.

Humboldt Bay Pocket Gopher.

(Pl. III, fig. 6.)

Thomomys laticeps Baird, Proc. Acad. Nat. Sci. Philadelphia, VII, 335, Apr., 1855.

Type.—Collected at Humboldt Bay, California, by Lieut. W. P. Trowbridge, February 21, 1855. Type specimen in U. S. Nat. Mus.

Distribution.—Coast region of northwestern California, from Smith River south to Eel River (fig. 6).

Characters.—Size and general appearance of *bottæ,* but color warmer and brighter and less clouded with black-tipped hairs; skull averaging slightly wider, and nasals especially wider; mammæ in 4 pairs.

Color.—Upperparts uniform clear rusty ochraceous or almost snuff brown, brighter than in *bottæ* and with less black; underparts light buffy ochraceous, in strong contrast with upperparts; feet and distal half of tail and usually lips and chin whitish. Summer and winter pelage identical in all specimens examined.

Skull.—Similar to that of *bottæ*, but slightly wider in proportion to length; middle of malar arch more indented; auditory meatus less inflated; lateral ridges not meeting in old males; nasals wide and not sharply emarginate posteriorly. *Dentition* about the same as in *bottæ* or slightly heavier.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 264; tail vertebræ, 88; hind foot, 33. Average of 5 topotypes (♀ ad.): 226, 77, 30. *Skull* (of topotype, ♂ ad.):[1] Basal length, 43; nasals, 16; zygomatic breadth, 30; mastoid breadth, 23; alveolar length of upper molar series, 9.

Remarks.—The subspecies *laticeps* is closely related to *bottæ*, but seems not to intergrade directly with it, as a smaller form of *bottæ* comes between. It can stand, however, as a well-marked subspecies. Specimens from the region of Humboldt Bay only are typical, while those from Crescent City are slightly paler. Two from Rio Dell may be grading toward *leucodon* and a small female from Alton Junction is doubtfully referred to *laticeps*. Specimens from Cuddeback and Hoopa are clearly intermediate between *laticeps* and *leucodon*, but are referred to the latter.

Specimens examined.—Total number, 90, as follows:

California (coast region of Humboldt and Del Norte Counties): Alton Junction, 1; Arcata (on Humboldt Bay), 49; Crescent City, 10; Eureka, 1; Requa, 6; Rio Dell, 2; Smith River, 2; Table Bluff (on Humboldt Bay), 16; Trinidad, 3.

THOMOMYS BOTTÆ LEUCODON Merriam.

White-Toothed Pocket Gopher.

(Pl. II, fig. 11; Pl. III, fig. 5.)

Thomomys leucodon Merriam, Proc. Biol. Soc. Washington, XI, 215, July 15, 1897.

Type.—Collected at Grants Pass, Rogue River Valley, Oregon, by Clark P. Streator, December 17, 1891. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Portions of northern California and southwestern Oregon, from Grants Pass, Oreg., south to Fairfield and Placerville, Cal. (fig. 6).

Characters.—Smaller, lighter, and brighter colored than *bottæ;* in winter pelage, very similar in color and markings to *laticeps*, much brighter in summer pelage; skull short and wide, with slender, projecting incisors, which are generally white or white tipped and with obscure inner grooves; mammæ in 4 pairs.

[1] No. 58452, U. S. Nat. Mus.

Color.—*Winter pelage:* Upperparts uniform dark rusty ochraceous or snuff brown; nose dusky; underparts light buffy ochraceous; feet, chin, and often cheeks and spots on belly white. *Summer pelage:* Upperparts dark cinnamon; underparts clear bright cinnamon.

Skull.—Low and wide with short, wide braincase, wide-spreading zygomatic arches, widest posteriorly, and wide, quadrate, or triangular interparietal; nasals short, deeply emarginate; bullæ small; pterygoids narrowly V-shaped. *Dentition* very light; incisors slender, mainly white or white tipped and projecting far beyond nasals and premaxillæ.

Measurements.—Type (young ♂): Total length, 221; tail vertebræ, 68; hind foot, 29. Topotype (old ♂): 246, 72, 32. Average of 4 topotypes (females): 188, 60, 28. *Skull* (of type): Basal length, 36; nasals, 13; zygomatic breadth, 26; mastoid breadth, 19; interorbital breadth, 6.5; alveolar length of upper molar series, 7. Skull of topotype (old ♂): 41, 15.8, 29, 23.5, 6, 8.

Remarks.—Typical *leucodon* differs widely from typical *bottæ*, but as the gap is largely bridged by the somewhat divergent characters of *navus*, and the chain of intergradation between the two extremes is complete, there is ample ground for grouping not only *leucodon* but *navus* and *mewa* as subspecies under *bottæ*. Only specimens from the Rogue River Valley can be considered typical of *leucodon*, but in spite of much variation specimens occurring over a wide range of rough mountain, valley, and foothill country south to Fairfield, Cal., can better be referred to *leucodon* than to any other form. Skins of Fairfield specimens are indistinguishable from topotypes of *leucodon*, but the skulls are close to *navus*. The principal variation over this range is in a reversion toward the cranial characters of *bottæ* to the southward and a brightening of color in the less humid interior. These brighter-colored specimens are externally very similar to typical *fulvus* of the San Francisco Mountain plateau region of Arizona, but comparison of skulls shows that the resemblance is only superficial. Specimens from Hoopa Valley and Cuddeback are clearly intermediate between *leucodon* and *laticeps* but are listed under *leucodon*. Those from Cuddeback also strongly suggest *bottæ* but are rather small and in this approach *minor*.

Specimens examined.—Total number, 313, as follows:

California: Baird, 3; Battle Creek, 2; Big Valley Mountains, 12; Bartlett Mountain, 5; Berger Creek (Mendocino County), 1; Blue Canyon, 1; Briceland, 6; Burney, 5; Cahto, 1; Calistoga, 2; Cassel, 1; Cuddeback, 9; Dana, 4; Downieville, 1; Dutch Flat, 2; Edgewood (Shasta Valley), 2; Eel River (head of, near South Yolla Bolly Mountain), 1; Fairfield, 6; Fair Oaks, 13; Fall River Mills, 2; Fort Jones, 1; Fyffe, 5; Gazelle, 6; Genesee, 3; Glen Ellen, 2; Gold Run, 6; Goosenest Mountain (Shasta Valley), 1; Greenville, 1; Hayden Hill, 1; Helena, 26; Hoopa Valley, 7; Hornbrook, 10; Indian Valley (Lassen County), 2; Lakeport, 1; Laytonville, 1; Lower Lake, 12; Mad River, near Kunz (Trinity County), 6; Mountain House (Butte County), 8; Mount George, 1; Mount

St. Helena, 3; Mount Sanhedrin (3 miles west of summit), 8; Mount Veeder, 2; Novato, 6; Old Fort Crook, 20; Petaluma, 3; Picard, 9; Placerville, 2; Post Creek, 2; Prattville, 1; Quincy, 6; Rumsey, 6; Slippery Ford, 4; Snow Mountain (Colusa County), 3; Susanville, 3; Tower House, 5; Ukiah, 7; Vacaville (8 miles west), 7.

Oregon: Ashland, 2; Ferren, 3; Grants Pass, 27; Grizzly Peak (west slope), 5.

THOMOMYS BOTTÆ NAVUS Merriam.

Red Pocket Gopher.

(Pl. IV, fig. 3.)

Thomomys leucodon navus Merriam, Proc. Biol. Soc. Washington, XIV, 112, July 19, 1901.

Type.—Collected at Red Bluff, California, by Clark P. Streator, December 26, 1893. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Sacramento Valley, Cal., from Battle Creek, Tehama County, south to Tracy Lake, San Joaquin Valley (fig. 6).

Characters.—Size much smaller than *bottæ;* color lighter; skull relatively shorter and wider, with more projecting incisors, intermediate to some extent between *bottæ* and *leucodon;* mammæ in 4 pairs.

Color.—*Winter pelage:* Upperparts light rusty ochraceous, darker on back, face, and nose; ears blackish; underparts pale buffy or ochraceous; feet whitish. *Summer pelage* (as shown in one July specimen from Marysville Buttes): Slightly brighter and more fulvous above and below than in winter.

Skull.—Short and wide with zygomatic arches widest posteriorly; nasals short, cuneate, emarginate posteriorly; bullæ not large but smoothly rounded. From the skull of *leucodon* it differs in smaller size, narrower interorbital constriction, orange coloration and relatively heavier incisors. *Dentition* light; incisors slender, protruding, and bright orange except the white tips.

Measurements.—Average of 4 topotypes (♂ ad.): Total length, 203; tail vertebræ, 67; hind foot, 27.5. Average of 4 topotypes (♀ ad.): 189, 61, 26.5. *Skull* (of type, ♂ ad.): Basal length, 35; nasals, 13; zygomatic breadth posteriorly, 25; mastoid breadth, 20; alveolar length of upper molar series, 7.

Remarks.—By treating *leucodon* as a subspecies of *bottæ,* it becomes necessary to place *navus* under *bottæ,* with which it connects at one angle as it does with *leucodon* at another. While typical Sacramento Valley specimens of *navus* are strongly marked, others would go with one form as well as with another. Fairfield specimens may with equal propriety be placed with *bottæ, navus,* or *leucodon.* Again, on the east side of the Sacramento Valley, the gradation northward is toward *leucodon,* and southward toward *mewa.* Wheatland and Jackson specimens, though having typical *navus* skulls, are dark and rich in color, approaching *leucodon.*

Specimens examined.—Total number, 178, as follows:

California (Sacramento Valley): Carbondale, 23; Chico, 19; Colusa, 3; Davis, 1; Grafton (Knights Landing), 7; Jackson, 4; Leesville (5 miles west), 2; Marysville Buttes, 38; Mokelumne Hill, 2; Nelson, 1; Oroville (6 miles east), 2; Payne, 1; Red Bluff, 42; Sacramento, 1; St. John, 1; Sites, 8; Tehama, 6; Tracy Lake (San Joaquin Valley), 9; Wheatland, 4; Willows, 1; Winslow, 3.

THOMOMYS BOTTÆ MEWA Merriam.

Digger Pine Pocket Gopher.

(Pl. V, fig. 10.)

Thomomys mewa Merriam, Proc. Biol. Soc. Washington, XXI, 146, June 9, 1908.

Type.—Collected at Raymond, Madero County, California, by N. Hollister, June 28, 1904. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Foothill country on east side of San Joaquin Valley, Cal., from Kernville north to Chinese (fig. 6).

Characters.—Smaller than *bottæ*, blacker in winter pelage, more intensely ochraceous-tawny in summer; skull relatively shorter and wider with more rounded bullæ; mammæ in 4 pairs.

Color.—*Winter pelage:* Whole upperparts dull ochraceous-tawny, heavily clouded with glossy black; underparts bright ochraceous; feet whitish; tip of tail whitish or gray. *Summer pelage:* Upperparts rich ochraceous-tawny, darkening to blackish on forehead and around nose and ears; underparts lighter and brighter; nose rufous; feet and tip of tail whitish.

Skull.—Smaller than in *bottæ* and relatively shorter and wider, with fuller, shorter, more rounded bullæ. Size of *navus*, but with less protruding incisors and with zygomatic arches not so conspicuously widened posteriorly; incisors with well-defined inner groove.

Measurements.—Type (♂ ad.): Total length, 225; tail vertebræ, 60; hind foot, 27. Topotype (♀ ad.): 196, 53, 25. *Skull* (of type): Basal length, 37.4; nasals, 13; zygomatic breadth, 24.7; mastoid breadth, 20; alveolar length of upper molar series, 7.

Remarks.—This little, richly colored gopher occupies the Upper Sonoran foothill country from Kernville north to Chinese but farther north grades into *navus*, as shown by Wheatland and Jackson specimens. Others from Merced approach *pascalis* in color but have more nearly the cranial characters of *mewa*. Four females from Kernville are peculiar in abruptly decurved incisors and very rich color. A series of 13 December specimens from Salt Springs are in the fresh black winter pelage with an iridescent purple gloss.

Specimens examined.—Total number, 117, as follows:

California (east side of San Joaquin Valley): Bower Cave (near Mariposa), 3; Camp Badger (Fresno County), 1; Chinese, 2; Coarse Gold, 6; Coulterville, 2; Fresno Flat, 5; Kernville, 4; Merced, 6; Merced Falls, 8; Porterville (8 miles east), 3; Raymond, 58; Salt Springs, 13; Three Rivers, 3; Wawona, 3.

THOMOMYS BOTTÆ MINOR Bailey.

MENDOCINO POCKET GOPHER.

(Pl. IV, fig. 2.)

Thomomys bottæ minor Bailey, Proc. Biol. Soc., Washington, XXVII, 116, July 10, 1914.

Type.—Collected at Fort Bragg, Mendocino County, California, by James H. Gaut, November 30, 1905. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Coast region of California, from Cape Mendocino south to Cazadero (fig. 6).

Characters.—Size smaller than *bottæ;* color slightly darker; skull narrower and slenderer, with especially slender rostrum, and deeply emarginate posterior tip of nasals; mammæ in 4 pairs.

Color.—In November pelage, upperparts dark, rich ochraceous or cinnamon-brown, heavily obscured with black, and in most specimens becoming almost black on nose, face, and around ears; feet white; tail grayish; underparts ochraceous-buff; lips and lining of cheek pouches usually white. Summer pelage but little lighter or brighter.

Skull.—Very slender and rather narrow, with very narrow and deeply emarginate nasals, slender zygomata, rather large and quadrate interparietal, very small and short audital bullæ. *Dentition:* Incisors slender, light colored, and projecting about as in *bottæ.*

Measurements.—Type (♂ ad.): Total length, 226; tail vertebræ, 73; hind foot, 29. Average of 3 adult males: 219, 73, 29. Topotype (♀ young ad.): 187, 58, 24. *Skull* (of type): Basal length, 35; nasals, 13.4; zygomatic breadth, 23; mastoid breadth, 19; interorbital breadth, 4.7; alveolar length of upper molar series, 7.5.

Remarks.—This little, dark, narrow-skulled gopher of the rugged coast strip south of Humboldt Bay can not be included with *bottæ* or *leucodon,* and it is still more distinct from the big, wide-skulled *laticeps.* It closely resembles *nigricans,* but can be distinguished at a glance by its slender, protruding incisors.

Specimens examined.—Total number, 56, as follows:

California: Cape Mendocino, 2; Cazadero (7 miles west), 3; Ferndale, 11; Fort Bragg, 4; Gualala, 9; Gurneyville (1 mile west), 1; Mendocino City, 12; Petrolia, 4; Punta Arena, 7; Rockport, 2; Westport, 1.

THOMOMYS BOTTÆ DIABOLI Grinnell.

DIABLO POCKET GOPHER.

Thomomys diaboli Grinnell, Univ. of Cal., Publ. Zool. XII, 313, Nov. 21, 1914.

Type.—Collected in Diablo Range, Merced County, California, at Sweeney's ranch, 22 miles south of Los Banos, by C. H. Richardson and H. A. Carr, April 2, 1911. Type specimen in Mus. Vert. Zool., Univ. of California.

Distribution.—Inner ridge of the Coast Ranges along west side of the San Joaquin Valley, Cal. (fig. 6).

Characters.—Size small, about as in *navus;* color bright yellowish brown, much as in *angularis,* brighter than summer pelage of *bottæ;* skull a miniature of the *bottæ* skull, with short, wide braincase and projecting incisors.

Color. Summer pelage (March and October specimens): Upperparts bright sayal brown, with but slight darkening of black-tipped hairs; ears and ear patches black; nose dusky; underparts clear, bright ochraceous-tawny; lips and lining of cheek pouches white; tail buffy; feet whitish. *Winter pelage* (as shown in a few not fully typical October specimens from Pacheco Pass and Pacheco Peak): Much darker than in summer, but apparently not so black as in *bottæ.*

Skull.—Similar to that of *bottæ* but smaller and slenderer, with especially slender rostrum and zygomatic arches. *Dentition:* Teeth very light, incisors slender and projecting well beyond tip of nasals, pale yellow or whitish.

Measurements.—Type (♀ young ad.): Total length, 180; tail vertebræ, 60; hind foot, 25. Female topotype: 193, 65, 26.[1] Average adult male from Pacheco: 218, 65, 30; female: 201, 57, 28. *Skull* (of type, ♀ ad.): Basal length, 31; nasals, 10.3; zygomatic breadth, 22; mastoid breadth, 17.9; interorbital breadth, 7; alveolar length of upper molar series, 7.2. Skull of topotype (♂ ad.): 34, 12, 24, 19.3, 6, 7.2. Skull of old male from Pacheco Pass:[2] 37, 12, 25, 20.7, 5.5, 7.5. Skull of old female: 32, 10, 22, 19, 5.5, 7.

Remarks.—This depauperate form of *bottæ* seems to be a product of the hot and arid Upper Sonoran inner ridge of the Coast Ranges along the west side of the San Joaquin Valley, in what Dr. Grinnell calls the "hillside juniper association." It needs no comparison with the robust and massive-skulled *angularis* of the valley along its eastern border, but could easily be confused with intermediates between *leucodon* and *navus* from similar arid ridges north of San Francisco Bay. The skull, however, is more nearly of the true *bottæ* type.

Specimens examined.—Total number, 19, as follows:

California: McKittrick, divide west of (Kern County, 3,000 feet altitude), 1; Pacheco Pass (Santa Clara County), 6; Pacheco Peak (Santa Clara County), 6; Sweeney's Ranch (Diablo Range, Merced County), 6.

[1] Foot measured dry.

[2] No. 150799, Biological Survey collection.

THOMOMYS BOTTÆ ANGULARIS Merriam.

Los Banos Pocket Gopher

(Pl. III, fig. 7.)

Thomomys angularis Merriam, Proc. Biol. Soc. Washington, XI, 214, July 15, 1897.

Type.—Collected at Los Banos, Merced County, California, by J. Ellis McLellan, January 1, 1894. Type specimen in U. S. Nat. Mus.. Biological Survey collection.

Distribution.—West side of San Joaquin Valley, Cal., from Tracy south to Santiago Spring; also Santa Clara, San Juan, and Salinas Valleys (fig. 6).

Characters.—Size large, hind foot in males averaging 33; ears short and thick; color lighter and brighter than in *bottæ;* skull short, wide, angular, and heavily ridged; mammæ in 4 pairs. inguinal 2–2, pectoral 2–2.

Color.—Summer pelage: Rich ochraceous-buff, slightly darkened above with black-tipped hairs; ear patch black; nose and cheeks dusky or brownish; lining of pockets, lips, and sometimes chin, white; feet white; tip of tail nearly or quite naked. *Winter pelage:* Considerably darkened above by excess of black-tipped hairs; slightly paler below—not quite so black as *bottæ.*

Skull.—Males: Relatively shorter, wider, more angular, and more heavily ridged than in *bottæ,* with high sagittal crest in adults; nasals short and widely spatulate; incisors projecting about as in *bottæ.* Females: Much smaller, not ridged or angular; short and wide with arched outline.

Measurements.—Average of 6 topotypes (♂ ad.): Total length, 258; tail vertebræ, 80; hind foot, 33. Average of 4 topotypes (♀ ad.): 209, 66, 28.5. *Skull* (of type, small ♂ ad.): Basal length, 43; nasals, 15.7; zygomatic breadth, 28; mastoid breadth, 24; alveolar length of upper molar series, 8.5. *Skull* (of topotype, larger ♂ ad.):[1] 45, 15, 31, 25, 9.

Remarks.—Specimens from the type locality of *angularis* show strongly marked characters, and considered alone these would indicate that this is a distinct species not closely related to *bottæ;* others, however, from the Santa Clara, San Juan, and Salinas Valleys, while nearest to *angularis,* show a tendency toward *bottæ* in both external and cranial characters, and suggest the probability of intergradation along the sides of these valleys with the smaller, darker, slenderer-skulled *bottæ.*

Specimens examined.—Total number, 101, as follows:

California: Bitterwater, 17; Coalinga, 2; Del Monte (7 miles southeast, in Salinas Valley), 5; Kings City, 1; Los Banos, 54; Palo Alto, 2; Paraiso Spring, 1; Paso Robles, 4; Salinas, 2; San Benito, 3; San Miguelito, 1; Santiago Spring, 2; Tracy (8 miles south), 7.

[1] No. 93787, U. S. Nat. Mus.

THOMOMYS BOTTÆ PASCALIS Merriam.

Fresno Pocket Gopher.

(Pl. IV, fig. 1.)

Thomomys angularis pascalis Merriam, Proc. Biol. Soc. Washington, XIV, 111, July 19, 1901

Type.—Collected at Fresno, San Joaquin Valley, California, by Clark P. Streator, March 4, 1892. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—East side of San Joaquin Valley, Cal., from Stockton south to San Emigdio Canyon and Cuyama Valley (fig. 6).

Characters.—Size approximately as in *bottæ;* hind foot averaging 32 mm. in adult males and 28 mm. in females; ear short; color dull ochraceous; skull with broad base and swollen bullæ; mammæ in 4 pairs: inguinal 2–2, pectoral 2–2.

Color.—*Winter pelage:* Upperparts dull ochraceous, slightly darkened on nose and face; ear patch inconspicuous; underparts paler ochraceous; feet white; irregular white spots in many specimens on legs, throat, and belly. *Summer pelage:* Brighter, more fulvous above and below than in winter pelage. The summer pelage is slightly paler than in *angularis* and the winter pelage instead of being darker than the summer, as in *angularis* and *bottæ,* is still paler.

Skull.—Shorter and wider, with larger bullæ and more swollen auditory meatus than in *bottæ;* smaller than in *angularis,* less ridged, with much larger, more rounded bullæ and with narrower angular process of lower jaw, and rarely with sagittal crest, even in old males.

Measurements.—Average of 3 topotypes (♂ ad.): Total length, 219; tail vertebræ, 73; hind foot, 32. Average of 4 females from type locality: 195, 63, 28. *Skull* (of type, ♂ ad.): Basal length, 41; nasals, 16; zygomatic breadth, 28; mastoid breadth, 23; alveolar length of upper molar series, 8.6.

Remarks.—Specimens from Tehachapi, Old Fort Tejon, and San Emigdio Canyon and Mount Pinos, at the south end of the San Joaquin Valley, vary from typical *pascalis* in smaller bullæ and larger auditory meatus, showing probable intergradation with *bottæ* of the adjoining chaparral-covered ranges. Specimens from Cuyama Valley about equally approach *pascalis, bottæ,* and *pallescens.* On the north, three specimens from Stockton might almost as well be referred to *angularis.*

Specimens examined.—Total number, 169, as follows:

California (San Joaquin Valley): Alila, 5; Bakersfield, 2; Bakersfield (8 miles northeast), 2; Bodfish, 11; Bodfish (12 miles below), 2; Buena Vista Lake, 6; Buena Vista Slough, 1; Buttonwillow, 12; Cuddy Canyon (near Frazer Mountain), 1; Cuyama Valley, 4; Delano, 1; Earlmart, 2; Fresno, 16; Lane Bridge, 29; Lemoore, 7; Modesto, 5; Mount Pinos (5,500–8,500 feet altitude), 6; Oakdale, 4; Old Fort Tejon, 10; San Emigdio Canyon, 7; Stockton, 3; Tehachapi, 10; Tejon Pass (8 miles west), 3; Tipton, 9; Tulare, 1; Walker Basin, 10.

THOMOMYS BOTTÆ PALLESCENS Rhoads.

GRAPELAND POCKET GOPHER.

(Pl. III, fig. 8.)

Thomomys bottæ pallescens Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 1895, 36, Feb. 21, 1895.

Type.—Collected at Grapeland, San Bernardino Valley, California, by R. B. Herron, March 22, 1894. Type specimen in Acad. Nat. Sci. Philadelphia.

Distribution.—San Bernardino Valley, Cal., north to San Fernando (fig. 6).

Characters.—Size of *bottæ*, but paler, and with buffy or whitish belly and less ridged skull; mammæ in four pairs.

Color.—Summer pelage: Upperparts dull ochraceous, darker along line of back and around nose; ear patch blackish; underparts pale buffy or soiled whitish. *Winter pelage:* Upperparts heavily clouded with blackish; underparts clear pale buff in sharp contrast.

Skull.—Long and narrow, with narrower braincase and less spreading zygomatic arches than in *bottæ;* lateral ridges parallel, never meeting in old males; incisors decurved more nearly at right angles to axis of skull.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 268; tail vertebræ, 84; hind foot, 32.3. Average of 5 females from type locality: 207, 64, 28. *Skull* (of topotype, ♂ ad.):[1] Basal length, 43; nasals, 16; zygomatic breadth, 27; mastoid breadth, 22; alveolar length of upper molar series, 9.5.

Remarks.—The subspecies *pallescens* is a large pale form of the *bottæ* group, differing from both *pascalis* and *altivallis* in cranial and external characters, but combining some of the characteristics of both with those of *bottæ*. The only typical specimens examined are from the great dry San Bernardino Valley. Those from San Fernando are darker colored and almost as near to *bottæ*, while Santa Paula, Mono Flats, and Little Pine Valley specimens might with almost equal propriety be referred to *pallescens* or *bottæ*.

Specimens examined.—Total number, 68, as follows (fig. 6):

California: Beaumont, 1; Cajon Pass (west slope), 1; Cajon Wash (near San Bernardino), 10; Cold Water Canyon, 1; El Casco, 4; Glendora, 4; Grapeland, 18; Jumpa Mountains, 2; Lytle Creek, 3; Rêche Canyon (4 miles southeast of San Bernardino), 3; San Bernardino, 17; San Fernando, 3; West Riverside, 2.

THOMOMYS BOTTÆ INFRAPALLIDUS Grinnell.

CARRIZO PLAIN POCKET GOPHER.

Thomomys infrapallidus Grinnell, Univ. of Cal. Publ. Zool., XII, 314, Nov. 21, 1914.

Type.—Collected on Carrizo Plain (Pimento Ranch, 7 miles south of Simmler) San Luis Obispo County, California, by H. S. Swarth, May 25, 1911. Type specimen in Mus. Vert. Zool., Univ. of California.

[1] No. 94013, U. S. Nat. Mus.

Distribution.—Carrizo Plain, Cal. (fig. 6).

Characters.—Size large, about as in *bottæ;* color pale, belly buff or whitish; skull similar to that of *bottæ*, but with smaller molars.

Color.—Summer pelage (May specimens): Upperparts dull ochraceous-buff, paler than in *angularis* or *pascalis;* nose brownish; ears blackish; underparts pale buffy or whitish (one specimen with almost pure white belly); feet and tail white.

Skull.—Very similar to that of *bottæ* but with conspicuously smaller molar crowns and smaller bullæ. The narrow skull and projecting incisors readily separate this race from *angularis* or *pascalis,* while the projecting incisors and shorter braincase distinguish it from *pallescens.*

Measurements.—Type (♂ ad.): Total length, 248; tail vertebræ, 76; hind foot, 34. Female topotype: 205, 70, 29. *Skull* (of type): Basal length, 40; nasals, 15; zygomatic breadth, 29; mastoid breadth, 23; interorbital breadth, 6.7; alveolar length of upper molar series, 8.

Remarks.—This is evidently a rather local form of the *bottæ* group occupying the hot, arid, alkaline desert valley known as Carrizo Plain. It is paler and more strongly differentiated than is the Cuyama Valley form, in which some of the same characters are less emphasized. These specimens it seems better to identify with *pascalis.* Dr. Grinnell says of the Carrizo Plain, "Faunally and zonally it may be considered very arid, high Lower Sonoran. A sparse prairie vegetation grows on ground that is more or less strongly alkaline over most of the area." [1]

Specimens examined.—Total number, 9, as follows:

California (Carrizo Plain): Painted Rock (5 miles north),3; Simmler (7 miles south), 6.

THOMOMYS BOTTÆ NIGRICANS Rhoads.

Stephens Pocket Gopher.

(Pl. V, fig. 16.)

Thomomys fulvus nigricans Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 1895, 36, Apr. 12, 1895.

Thomomys aphrastus Elliot, Field Columb. Mus., zool. ser., III, 219, June, 1903. *Type* from Santo Tomas, Lower California, 18 miles south of Ensenada at 50–100 feet altitude. Type collected by E. Heller; type specimen in Field Mus. Nat. Hist.

Type.—Collected at Witch Creek, 2,753 feet altitude (7 miles west of Julian), San Diego County, California, by F. Stephens, December 22, 1893. Type specimen in Acad. Nat. Sci. Philadelphia.

Distribution.—Southwestern California and northern Lower California, from the San Jacinto Mountains, Cal., south to Ubar, Lower California (fig. 7).

[1] Univ. of Cal., Publ. Zool., XII, 314, 1914.

Characters.—Size smaller than *bottæ*, with the same small ears and very similar colors in both winter and summer pelage; skull slenderer, with shorter bullæ and less projecting incisors; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—*Winter pelage:* Upperparts dark ochraceous-tawny, darkened above by black-tipped hairs; nose, cheeks, and ear patches blackish; underparts lightly washed with rich ochraceous; tip of tail, hind feet, and lining of cheek pouches usually whitish. *Summer pelage:* Lighter and suffused with tawny above and below. *Young*, paler, more buffy above and whitish below.

Skull.—Relatively narrower, slenderer, and less arched than that of *bottæ;* bullæ shorter, more rounded; interparietal more quadrate; external auditory meatus with less expanded rim. *Dentition* lighter; incisors less projecting and more distinctly grooved. It differs from *fulvus*, with which it was originally compared, in less spreading zygomatic arches, slenderer rostrum, and relatively narrower braincase.

Measurements.—Topotype (♂ ad.):[1] Total length, 231; tail, 74; hind foot, 30. Average of 5 typical males from San Jacinto Mountains: 232, 77, 30.2. Average of 5 females: 199, 65, 27.4. *Skull* (of topotype, ♂ ad.):[2] Basal length, 34.5; nasals, 13.5; zygomatic breadth, 23; mastoid breadth, 18; interorbital breadth, 6.5; alveolar length of upper molar series, 7.5.

Remarks.—From *bottæ*, *nigricans* differs in lighter, slenderer skull; more abruptly decurved and more distinctly grooved incisors; lighter dentition; and numerous details of cranial and external characters; but scarcely if at all in color. It is much smaller and darker than *pallescens* with which it intergrades at Elsinore and Wildomar, while Twin Oak specimens are clearly intermediate between *nigricans* and *bottæ*.

In a series of 18 specimens from Santo Tomas, Lower California, I find no characters by which to recognize *Thomomys aphrastus* as even subspecifically different from *nigricans*. A series of 32 specimens of *alticolus* from the Victoria Mountains, farther south on the peninsula, are scarcely distinguishable from *nigricans* in external characters, but in cranial characters tend toward *anitæ*.

Specimens examined.—Total number, 401, as follows:

California (southern): Ballena, 1; Campo (San Diego County, at 2,500 feet altitude), 8; Cuyamaca Mountains, 16; Dulzura, 14; Escondido, 3; Foster, 5; Fullers Mill, 1; Grapevine Spring, 1; Hemet Valley, 5; Jacumba, 11; Jamul Creek, 3; Julian, 15; Kenworthy, 2; La Puerta, 24; Mountain Spring, 1; Pine Mountains, 1; Poway, 1; Rose Canyon, 1; San Jacinto Mountains (south end at 5,000 to 8,000 feet), 21; Santa Rosa Peak, 1; Santa Ysabel, 15; Schains Ranch, 4; Strawberry Valley (in central part of San Jacinto range at 6,000 feet), 24; Thomas Mountain, 1; Tia Juana, 2; Tia Juana River (mouth), 1 Warners Pass, 7; Witch Creek (San Diego County at 2,750 feet), 53.

[1] No. 148685, U. S. Nat. Mus. [2] No. 148688, U. S. Nat. Mus.

Lower California: Agnaji de las Fresas, 2; Ensenada, 6; Ensenada (canyon 20 miles east), 1; Fresnal, 1; Hanson Laguna, 11; La Grulla (at 7,000 feet altitude), 13; La Huerta (Hanson Laguna Mountains), 1; Mattomi, 1; Milquatay Valley, 2; Nachoguero Valley, 4; Parral, 5; Pinon (west slope San Pedro Martir Mountains), 3; Rancho la Progresa, 5; Rancho Santo Tomas (12 miles south of La Grulla), 3; Rancho Viejo (15 miles south of Alamos), 5; Rosarito, 2; San Antonio, 3; San Francisquito, 2; San Pedro Martir Mountains, 11; San Quintin, 14; San Telmo, 18; San Ysidro Ranch, 4; Santa Eulalia, 7; Santa Rosa, 1; Santo Tomas, 18; Socorro, 2; Tecate Valley, 2; Trinidad Valley (northwest base San Pedro Martir Mountains), 2; Vallecitos, 6; Yubay, 4 (not typical).

THOMOMYS BOTTÆ PUERTÆ Grinnell.

La Puerta Pocket Gopher.

Thomomys nigricans puertæ Grinnell, Univ. of Cal., Publ. Zool., XII, 315, Nov. 21, 1914.

Type.—Collected at La Puerta (Mason's Ranch, 5 miles west of Vallecitos, at the lower end of La Puerta Valley), San Diego County, California, by F. Stephens, May 31, 1909. Type specimen in Mus. Vert. Zool., Univ. of California.

Distribution.—La Puerta and San Felipe Valleys, Cal. (fig. 6).

Characters.—In size, proportions, and cranial characters, very similar to *nigricans*, but much paler in both summer and winter pelage; considerably brighter than *cabezonæ*.

Color.—Summer pelage: Upperparts pale ochraceous-tawny, becoming darker along median line of back; ears and postauricular spot black; nose and face brownish or dusky; underparts pale or bright cinnamon; feet and tail buffy or soiled whitish. *Winter pelage:* Duller and more grayish, fading to pinkish- or vinaceous-salmon in bright-colored individuals.

Skull.—Not readily distinguishable from that of *nigricans* from the surrounding chaparral slopes.

Measurements.—Type (♂ young ad.): Total length, 203; tail vertebræ, 80; hind foot, 28. *Skull* (of type): Basal length, 32; nasals, 12; zygomatic breadth, 21.2; mastoid breadth, 18; interorbital breadth, 6; alveolar length of upper molar series, 7.

Remarks.—The series of 43 specimens in the Museum of Vertebrate Zoology labeled La Puerta were collected by F. Stephens, and Grinnell says, "According to his field notebook, the majority were caught in cultivated land on Mason's Ranch, which is located at the lower end of La Puerta Valley. Others, however, were taken on surrounding hillsides."[1] The 43 specimens divide readily into 21 of the present pale form and 22 of the typical dark-colored *nigricans*. These I assume represent a pale desert form from the valley bottom where creosote bush, mesquite, and cactus indicate extreme arid Lower Sonoran conditions; and typical *nigricans* from the Upper Sonoran chaparral-

[1] Univ. of Cal. Pub. Zool., XII, 315, Nov. 21, 1914.

covered slopes along the sides of the valley. In a valley so narrow the two forms undoubtedly intermingle to some extent along the boundaries of their respective habitats, but most of the specimens show no intermediate characters.

Specimens examined.—Total number, 23, as follows:

California: La Puerta, 21; San Felipe Valley, 2.

THOMOMYS BOTTÆ ANITÆ Allen.

Cape San Lucas Pocket Gopher.

(Pl. V, fig. 11.)

Thomomys fulvus anitæ Allen, Bul. Am. Mus. Nat. Hist., X, 146–147, 1898.

Type.—Collected at Santa Anita, Lower California, by Dane Coolidge, May 28, 1896. Type specimen in British Museum.

Distribution.—Southern part of Lower California from Santana south to Cape San Lucas (fig. 7).

Characters.—Slightly smaller than *bottæ;* larger than *nigricans;* thin haired, bright tawny all over at all seasons, but little darker above than below; skull heavy, with abruptly decurved incisors; mammæ in 4 pairs.

Color.—For most of the year bright tawny, nearly concolor; underparts slightly lighter because thinly haired; feet and tail half naked. In new autumn pelage, apparently from September to December, slightly duller, more grayish. *Young,* slightly paler, with whitish belly.

Skull.—Relatively heavier than in *bottæ* or *nigricans,* with short, heavy rostrum, abruptly decurved incisors, short thick pterygoids, and full rounded bullæ.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 243; tail vertebræ, 78; hind foot, 32.8. Average of 5 topotypes (♀ ad.): 208, 67, 30. *Skull* (of topotype, ♂ ad.):[1] Basal length, 40; nasals, 14; zygomatic breadth, 25.5; mastoid breadth, 21; interorbital breadth, 6.5; alveolar length of upper molar series, 8.8.

Remarks.—Evidently intergradation is complete through local forms up the peninsula through *nigricans* to *bottæ.* The subspecies *anitæ* strikingly resembles *fulvus,* however, and but for its direct connection with *bottæ* I should not change Dr. Allen's original arrangement, making it a subspecies of *fulvus.* The *bottæ* and *fulvus* groups are widely separated geographically. Externally *anitæ* is not easily distinguishable from *sinaloæ,* just across the gulf, but the skulls are different.

Specimens examined.—Total number, 99, as follows:

Lower California: Cape San Lucas, 11; La Paz, 12; Las Palmas, 1; Matancita, 6; Miraflores, 5; Rosarito, 20; San Jorge, 5; San Jose del Cabo, 10; Santana, 8; Santa Anita, 16; Tres Pachitas, 1; Triunfo, 4.

[1] No. 146831, U. S. Nat. Mus.

THOMOMYS BOTTÆ ALTICOLUS Allen.

SIERRA LAGUNA POCKET GOPHER.

(Pl. IV, fig. 8.)

Thomomys fulvus alticolus Allen, Bul. Am. Mus. Nat. Hist., XII, 13, Apr. 4, 1899.

Type.—Collected at Sierra Laguna, Lower California, Mexico (altitude 7,000 feet), by Dane Coolidge, July 10, 1896. Type specimen in British Museum.

Distribution.—Victoria Mountains, southern Lower California (fig. 7).

Characters.—Size and proportions of *anitæ* or slightly smaller; well furred and dark colored; skull slightly slenderer than in *anitæ*, but very similar; mammæ in 4 pairs.

Color.—*Winter pelage:* Upperparts dark ochraceous or snuff brown, heavily clouded with dusky, usually darkest along median line of back; nose, ear patch, and cheeks blackish; underparts washed with bright ochraceous-tawny; lining of cheek pouches, feet, and tip of tail usually whitish. *Summer pelage:* Clear ochraceous, scarcely darker above than below, or varying to almost black in specimens with a strong tendency toward dichromatism.

Skull.—Slightly slenderer than that of *anitæ*, less slender than in typical *nigricans*, and with larger bullæ, wider occiput, and wide premaxillæ.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 225; tail vertebræ, 72; hind foot, 30. Average of 5 topotypes (♀ ad.): 203, 67, 28. *Skull* (of topotype, ♂ ad.): Basal length, 38; nasals, 13.5; zygomatic breadth, 24; mastoid breadth, 20; interorbital breadth, 6.5; alveolar length of upper molar series, 8.5.

Remarks.—This is a dark, mountain form of *anitæ* from the higher zone of nut pines and oaks. The two forms are so closely related that the skulls are practically indistinguishable, but the skins greatly differ in color. Compared with *nigricans*, the skins are scarcely distinguishable, but the skulls are strikingly different.

Specimens examined.—Total number, 52, as follows:

Lower California (southern): La Laguna, 20; Victoria Mountains, 32.

THOMOMYS BOTTÆ RUSSEOLUS Nelson & Goldman.

SAN ANGEL POCKET GOPHER.

(Pl. IV, fig. 9.)

Thomomys bottæ russeolus Nelson & Goldman, Proc. Biol. Soc. Washington, XXII, 25, Mar. 10, 1909.

Type.—Collected at San Angel, Lower California, at 100 feet above sea level, by E. W. Nelson and E. A. Goldman, October 15, 1905. Type specimen in U. S. Nat. Mus., Biological Survey collection.

---

[1] No. 146836, U. S. Nat. Mus.

Distribution.—Known only from type locality (fig. 7).

Characters.—Smaller than *anitæ* or *nigricans*, with tiny ears, slender skull, thin hair, and pale buffy coloration.

Color.—About as in *perpallidus*, or slightly brighter. October specimens: Upperparts varying from pale to bright buffy; nose grayish; small ear patch dusky; underparts pale buffy, becoming whitish on throat; feet and tail thinly clothed with whitish hairs.

Skull.—Light and slender, with narrow braincase, short narrow posteriorly truncate nasals, wide premaxillæ, slender pterygoids, full rounded bullæ, and narrowly constricted shaft of basioccipital. *Dentition:* Incisors abruptly decurved at right angles to axis of skull.

Measurements.—Type (♂ young ad.): Total length, 208; tail vertebræ, 73; hind foot (dry), 30. Topotype (♂ young ad.): 225, 82, 27 (dry). Topotype (♀ im.): 88, 60, 27 (dry). *Skull* (of type): Basal length, 35.5; nasals, 12.7; zygomatic breadth, approximately 24; mastoid breadth, 19; interorbital breadth, 6; alveolar length of upper molar series, 7.5.

Remarks.—While in color practically identical with *magdalenæ* and very similar to *perpallidus*, this desert form differs in cranial characters from *magdalenæ* and *anitæ* in light slender skull, slender pterygoids, large rounded bullæ, and narrow basioccipital; and from *perpallidus* in narrow braincase, wider premaxillæ, and uniformly truncate nasals. The characters strongly suggest a little slender-skulled form of *perpallidus*. The type specimens are from an oasis in a sandy desert where they were apparently isolated, but specimens from Rosarito on the north and San Jorge on the south apparently intergrade with *anitæ*.

One specimen from San Jorge and two from Rosarito might be thrown with *russeolus* (though the majority from the same places are nearer *anitæ*), and on this account this form was made a subspecies of *bottæ* rather than of *perpallidus*.

Specimens examined.—Four, from type locality.

THOMOMYS MAGDALENÆ Nelson & Goldman.

Magdalena Pocket Gopher.

(Pl. V, fig. 12.)

Thomomys magdalenæ Nelson & Goldman, Proc. Biol. Soc. Washington, XXII, 24, Mar. 10, 1909.

Type.—Collected at Magdalena Island, near west coast of Lower California, by E. W. Nelson and E. A. Goldman, December 3, 1905. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Magdalena Island, Lower California (fig. 7).

Characters.—Larger than *anitæ*, with heavy, angular skull; color paler; hair thin.

Color.—Type (collected December 3): Upperparts bright buffy orange; underparts, feet, and tail pale buffy or whitish; a scarcely perceptible dusky ear spot.

Skull.—Old male: Very heavy and angular, with narrow braincase, short heavy rostrum, abruptly decurved incisors, angular and anteriorly spreading zygomatic arches, deep lateral pits of palate, prominent and revolutely margined pterygoids.

Measurements.—Type: Total length, 255; tail vertebræ, 87; hind foot, 36. *Skull*: Basal length, 41.5; nasals, 15; zygomatic breadth, 29; mastoid breadth, 23; interorbital breadth, 6; alveolar length of upper molar series, 9.

Remarks.—The type and only specimen of *magdalenæ* is a fine old male from this barren, sandy island off the coast of Lower California. While having strongly marked affinities with *anitæ* of the mainland, the single specimen is so different as to indicate a well-marked insular species. The general characters are those of *anitæ* greatly accentuated. It evidently belongs in the *bottæ* group and is not more different from that species than is *angularis*, just over the ridge from the type region of *bottæ*.

Specimen examined.—One, the type.

THOMOMYS ALTIVALLIS Rhoads.

San Bernardino Mountain Pocket Gopher.

(Pl. III, fig. 9.)

Thomomys altivallis Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 1895, 34, Feb. 21, 1895.

Type.—Collected on San Bernardino Mountains, California, (altitude 5,000 feet), by R. B. Herron, August 10, 1894. Type specimen in Acad. Nat. Sci. Philadelphia.

Distribution.—San Bernardino Mountains, Cal. (fig. 6).

Characters.—Size large, hind foot in males averaging 34, in females 30; ears short; color dull and dark; skull long, well ridged, with heavy dentition and sloping posterior base of zygoma; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2 (one individual with 2 pairs of abdominal also).

Color.—Paler than in *bottæ*, slightly duller and darker than in *pallescens;* upperparts dull ochraceous with trace of darker dorsal stripe; ear patch, nose, and cheeks blackish; underparts, feet, and most of tail buffy or soiled whitish. Pelage apparently brighter ochraceous in summer than in winter, but only traces of much-worn winter pelage are shown in the specimens examined.

Skull.—Longer and less spreading than in *bottæ*, less sharply ridged, with less inflated auditory meatus, and heavier rostrum; larger than in *pallescens*, with heavier rostrum and less sharply constricted posterior base of zygomatic arch.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 269; tail vertebræ, 78; hind foot, 34. Average of 5 topotypes (♀ ad.): 224, 64, 30. *Skull* (of topotype, old ♂):[1] Basal length, 46; nasals, 17; zygomatic breadth, 30; mastoid breadth, 24; alveolar length of upper molar series, 10.

Remarks.—*Thomomys altivallis* apparently has its nearest relative in *pallescens*, which stands intermediate in characters and geographic position between it and *bottæ*. It is probably a robust, mountain form of the *bottæ* group occupying the higher levels of the San Bernardino Mountains. The exact type locality is unknown other than as 5,000 feet altitude in the San Bernardino Mountains. Herron, who collected it, is no longer living, and S. N. Rhoads, who described the species, has no further information as to its location. The type specimen, however, is of the large, high-mountain form, agreeing with the large series from Bluff Lake and vicinity.

Specimens examined.—Total number, 155, as follows:

California (at various altitudes from 2,700 to 9,200 feet in the San Bernardino Mountains): Bear Lake, Bear Valley, Bluff Lake, Doble, Dry Lake, Fish Creek, Santa Ana River, Seven Oaks, Sugarloaf, Waterman Canyon, and Fawnskin Park.

Thomomys alpinus Group.

THOMOMYS ALPINUS ALPINUS MERRIAM.

MOUNT WHITNEY POCKET GOPHER.

(Pl. V, fig. 13.)

Thomomys alpinus Merriam, Proc. Biol. Soc. Washington, XI, 216, 1897.

Type.—Collected on Big Cottonwood Meadows (8 miles southeast of Mount Whitney), at 10,000 feet altitude in the Sierra Nevada, California, by B. H. Dutcher, August 6, 1891. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Southern part of the Sierra Nevada, Cal., at altitudes between 6,000 and 11,000 feet, from Mount Whitney south to Siretta Meadows (fig. 6).

Characters.—Size large; hind foot about 30 mm. in both males and females; sexes very similar; ears large and conspicuous; colors dull and dark; skull not ridged or angular; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—*Summer pelage:* Dull dark ochraceous (much as in *bottæ*), becoming blackish along middle of back, paler on belly; nose blackish; throat white; feet and distal two-thirds of tail whitish. One immature specimen is paler, more ochraceous above and buffy below. *Winter pelage* (long and faded on rump and sides in July specimens): Dull dark clay color.

[1] No. 89968, U. S. Nat. Mus.

Skull.—Compared with that of *bottæ* the skull is light and slender, without conspicuous ridges or angles in old age; the incisors are decurved; interorbital region wide and flat; interparietal quadrate; auditory meatus smaller; zygomatic arches less spreading; and nasals conspicuously widened anteriorly. From that of *fulvus* the skull differs less in size and proportions, but has relatively heavier dentition; smaller bullæ; narrower basioccipital; larger, more quadrate interparietal; and narrower posterior part of nasals.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 222; tail vertebræ, 61; hind foot, 30.3. Average of 5 topotypes (♀ ad.): 222, 63, 30. *Skull* (of type, ♂ ad.): Basal length, 36; nasals, 14; zygomatic breadth, 25; mastoid breadth, 19; interorbital breadth, 6.6; alveolar length of upper molar series, 8.

Remarks.—Typical *alpinus* seems not readily to fall into any of the larger groups of species. From *fulvus* it differs more than from *bottæ*, and from the little slender-skulled *monticola* still more widely, except in the large ears. From the *perpallidus* group it differs in long, narrow skull, large molars, and in so many other details as to indicate no close connection. From *nigricans* it differs less in either color or cranial characters than from *bottæ* but shows larger molars, more spreading nasals, greatest width of zygomata posterior instead of anterior to middle, and other distinctions. For the present it may well be retained as the center of a group to which *awahnee* and *neglectus* belong, and possibly also *jacinteus* and *martirensis*.

Specimens examined.—Total number, 158, as follows:

California (southern High Sierra): Big Cottonwood Meadows (10,000 feet altitude), 30; Cottonwood Creek (9,500 feet), 2; Cottonwood Lakes (11,000 feet), 25; Jackass Meadows (7,000 feet), 12; Jordan Hot Springs (6,700 feet), 8; Menache Meadows (8,000 feet), 17; Olanche Peak (9,000–9,750 feet), 6; Ramshaw Meadows, 3; Red Rock Meadows (9,000 feet), 2; Siretta Meadows (9,000 feet), 1; Trout Creek (6,000 feet), 19; Whitney Meadows (9,000 feet), 33.

THOMOMYS ALPINUS AWAHNEE Merriam.

Yosemite Pocket Gopher.

(Pl. V, fig. 9.)

Thomomys alpinus awahnee Merriam, Proc. Biol. Soc. Washington, XXI, 146, June 9, 1908.

Type.—Collected in Yosemite Valley, Mariposa County, California, (at 4,000 feet altitude in bottom of valley, near the Sentinel Hotel), by N. Hollister, June 14, 1904. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Western slopes of the Sierra Nevada, Cal., from Sequoia, Tuolumne County, south to Tehachapi Peak (fig. 6).

Characters.—Size small; colors dull and dark; skull slender and narrow, with short rostrum and abruptly decurved incisors; mammæ in 4 pairs.

Color.—Summer pelage: Upperparts dull dark ochraceous; underparts varying from pale buffy to ochraceous; belly irregularly marked and spotted with white in all Yosemite specimens; feet and distal half of tail whitish. *Winter pelage:* Darker, more dusky ochraceous.

Skull.—But little arched; not ridged or angular; rostrum short and incisors abruptly decurved; interorbital region wide and flat; interparietal usually short and wide; bullæ small and well rounded.

Measurements.—Topotype (♂ ad.): Total length, 220; tail vertebræ, 75; hind foot, 27. Type (♀ ad.): 194, 54, 26. *Skull* (of type): Basal length, 32; nasals, 12; zygomatic breadth, 21; mastoid breadth, 17; alveolar length of upper molar series, 7. Skull of male from Merced River: 34, 12.4, 22, 18.5, 7.5.

Remarks.—This form is not represented by a good series of adult male specimens from any one locality, but specimens from scattered localities throughout the Transition Zone, from Crockers (north of the Yosemite Valley) south to the vicinity of Mineral King, show the same general characters. Those from near Mineral King are somewhat darker than specimens from the Yosemite Valley and suggest an approach to *alpinus*, while those in the Yosemite are paler and have irregular white markings. Others from Kern River Lakes and Piute Mountain and one from Tehachapi Peak are also referred to it, but they show considerable variation.

Specimens examined.—Total number, 116, as follows:

California (southern and western slopes of the Sierra Nevada): Alta Meadows (Giant National Forest), 2; Connell Meadow (Tulare County, 7,500 feet altitude), 11; Halstead Meadows (in Sequoia National Park, 7,000 feet), 5; Horse Corral Meadows (in Sequoia National Park, 8,000 feet), 2; Huckleberry (near Giant National Forest), 1; Kaweah River (east fork, 5,600 and 8,900 feet), 2; Kern River Lakes, 2; Mineral King, 8; Piute Mountain (5,000 feet?), 31; Sequoia (Crockers), 6; South Fork Merced River (4,000 feet), 1; Taylor Meadow (Tulare County, 7,000 feet), 25; Tehachapi Peak, 1; Wawona, 2; Yosemite Valley, 17.

THOMOMYS NEGLECTUS Bailey.

San Gabriel Pocket Gopher.

(Pl. V, fig. 15.)

Thomomys neglectus Bailey, Proc. Biol. Soc. Washington, XXVII, 117, July 10, 1914.

Type.—Collected on San Antonio Peak (Bear Flat Meadows at 6,400 feet altitude) in the San Gabriel Mountains, California, by James H. Gaut, July 23, 1905. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Known only from type locality (fig. 6).

Characters.—Size medium; colors grizzled with a dark mixture of ochraceous and black; skull long and narrow, with almost straight dorsal outline; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—July pelage, in which 3 molts are shown: Upperparts dark gray produced by a heavy mixture of black-tipped hairs over dull ochraceous; nose, face, and ear patch blackish; tail gray; feet whitish; underparts dull buffy.

Skull.—Adult males: Long and narrow, with narrow braincase; nasals and rostrum long and straight; zygomatic arches slender; bullæ small and especially short and rounded; interparietal small and triangular.

Measurements.—Type (♂ ad.): Total length, 229; tail vertebræ, 77; hind foot, 32 (measured dry). Topotype (♂ ad.): 206, 64, 31. Female topotype: 211, 65, 31. *Skull* (of type): Basal length, 37; nasals, 14.5; zygomatic breadth, 24; mastoid breadth, 19.5; interorbital breadth, 6; alveolar length of upper molar series, 7.5.

Remarks.—Externally this species differs very little from *altivallis* of the San Bernardino Mountains, but the skulls show such striking differences that the two forms can not be considered closely related. Neither does the present form show any characters of *pallescens* on the south or of *perpes* on the north slopes of its range, but appears to approach *alpinus* and *awahnee* of the southern Sierra Nevada. Its actual range and real relationship present an interesting problem still to be worked out.

Specimens examined.—Three, from type locality.

THOMOMYS JACINTEUS Grinnell & Swarth.

San Jacinto Pocket Gopher.

(Pl. V, fig. 14.)

Thomomys jacinteus Grinnell & Swarth, Proc. Cal. Acad. Sci., 4th ser., IV, 153–160, Dec. 30, 1914.

Type.—Collected on San Jacinto Mountains (Round Valley, at 9,000 feet altitude), California, by H. S. Swarth, September 15, 1914. Type specimen in Mus. Vert. Zool., Univ. of California.

Distribution.—Upper slopes of San Jacinto Mountains, Cal. (fig. 6).

Characters.—Size medium, slightly larger than *nigricans*, much smaller than *altivallis*, and about the size of *martirensis* and *neglectus;* colors dark; skull long and narrow with relatively straight dorsal outline; mammæ in 4 pairs.

Color.—Summer pelage: Upperparts dark rich ochraceous, darkened with black-tipped hairs, darkest along median line of back; nose dusky; ears and ear patches black; underparts brighter ochraceous without black-tipped hairs; lining of cheek pouches and usually lips white; base of tail brownish; tip of tail and feet whitish. *Winter pelage:* More clouded by black above.

Skull.—Long, low, and narrow, with especially long narrow braincase; zygomatic arches widest at anterior angle and narrowed posteriorly with the narrowing of the braincase; nasals truncate posteriorly, generally long and narrowly cuneate, but in the type rather

wide and spatulate; interparietal rather small, quadrate, narrowing with age; pterygoids long and low and nearly parallel; interpterygoid fossa not narrowly V-shaped. *Dentition* relatively heavy; incisors curved abruptly downward and not extending much beyond tip of nasals and premaxillæ.

Measurements.—Type (♂ ad.): Total length, 240; tail vertebræ, 82; hind foot, 32. Topotype (♂ ad.): 234, 80, 31.5. Topotype (♀ ad.): 232, 76, 29. *Skull* (of type): Basal length, 40; nasals, 14.5; zygomatic breadth, 24.7; mastoid breadth, 20; interorbital breadth, 6; alveolar length of upper molar series, 8.8.

Remarks.—At first I was reluctant to separate this high-mountain form from *nigricans* by skull characters alone, as the skins are indistinguishable, but the series of specimens recently collected in Round Valley in the San Jacinto Mountains (at 9,000 feet altitude) by H. S. Swarth show that the skull characters are well marked and constant. The series of 8 males and 5 females from the type locality, now before me, have the long, low, narrow, straight skulls of *cabezonæ* with the same peculiar pterygoids. They differ from *cabezonæ* in larger size, heavier dentition, and much darker color, but show a decided relationship with that species. The resemblance to *nigricans* may be entirely superficial just as it is with *fulvus*, the three forms being very similar in coloration while evidently quite distinct. A close relationship with *neglectus* is indicated by the general type of skull, but that form is much more extreme in its characters. From *martirensis* the present form differs in a rather straight instead of well-arched outline of skull. The two other high-mountain species with which comparison is suggested are *altivallis* and *alpinus* from similar altitudes in the San Bernardino Mountains and the Sierra Nevada. Of these, *altivallis* is at once eliminated on account of its larger size and its broad, well-arched, and massive skull, protruding incisors, and narrowly contracted pterygoids. *Thomomys alpinus*, while so similar in general size and appearance as strongly to suggest relationship, has a very different type of skull; shorter, wider, and more arched zygomata (widest posteriorly); and too many detailed differences to admit of close relationship with the present form.

Specimens examined.—Total number, 25, as follows:

California (higher levels of San Jacinto Mountains): Round Valley (9,000 feet altitude) 8; San Jacinto Peak (10,200 feet), 1; Tahquitz Valley (8,000 feet), 13; Tamarack Valley (9,400 feet), 2; uncertain locality along the trail (8,500 feet), 1.

THOMOMYS MARTIRENSIS Allen.

San Pedro Martir Pocket Gopher.

Thomomys fulvus martirensis Allen, Bul. Am. Mus. Nat. Hist., X, 147, 1898.

Type.—Collected on San Pedro Martir Mountains (at 8,200 feet altitude), Lower California, by A. W. Anthony and E. C. Thurber, in May, 1893. Type specimen in Am. Mus. Nat. Hist.

Distribution.—San Pedro Martir Mountains, Lower California (fig. 7).

Characters.—Size considerably larger than *nigricans;* skull longer; colors grayer in both winter and summer pelage.

Color.—*Winter pelage:* Very long and dark gray, not so black as in *nigricans;* underparts buffy gray; tail and feet grayish; lining of cheek pouches white; no white on chin and throat. *Summer pelage:* Dull fulvous, not so intense as in *nigricans* or *fulvus.*

Skull.—Adult males: Very long and narrow, with especially narrow zygomatic arches and long, narrow braincase, in these characters apparently exceeding *neglectus* and *jacinteus;* dorsal outline arched, and rostrum depressed about as in *nigricans.*

Measurements.—Type (♂ ad.): Total length, 248; tail vertebræ, 67; hind foot (measured dry), 31. The tail measurement of type is short; other specimens have longer tails, 8 females averaging 70. *Skull:* Basal length, 41.6; nasals, 15; zygomatic breadth, 25; mastoid breadth, 21; interorbital breadth, 6.5; alveolar length of upper molar series, 8.

Remarks.—This is evidently a very local form occupying some high valley or the crest of the range, since other series from not far distant in the same range and only a little lower down, as at Vallecitos at 8,000 feet altitude, La Grulla at 7,000 feet, and Santo Tomas at 6,000 feet, are typical of *nigricans.* In December, 1914, A. W. Anthony wrote me that the type series of specimens was collected at La Grulla Meadows at 8,200 feet altitude in the San Pedro Martir Mountains, but the series of specimens collected by Nelson and Goldman at La Grulla (7,000 feet) are *nigricans.*

As the mountains rise to 10,200 feet, this may be a mountain-top form of considerable range. The true relationship of these high-mountain forms from *alpinus* to *martirensis* is not very clear and will not be until definite field study shows whether they merge into lower forms or are distinct and isolated.

Specimens examined.—Fourteen, from type locality.

Thomomys perpallidus Group.

THOMOMYS PERPALLIDUS PERPALLIDUS Merriam.

Palm Springs Pocket Gopher.

(Pl. V, fig. 2.)

Thomomys talpoides perpallidus Merriam, Science, VIII, 588, Dec. 24, 1886.

Type.—Collected at Palm Springs (Agua Caliente) Riverside County, California (at sea level on the edge of the Colorado Desert, 6 miles south of Palm Springs Station), by F. Stephens, March or April, 1886.[1] Type specimens in U. S. Nat. Mus., Merriam collection.

[1] In the original description no type was designated by number, but Dr. Merriam refers to several skins collected by F. Stephens in March and April on the Colorado Desert. In the Merriam collection are 4 skins and skulls labeled in accord with this statement, Nos. 22112 ♂, 22113 ♂, 22320 ♂, and 22321 ♀. Of these No. 22112 is the only fully adult male and should have been made the type.

Distribution.—Colorado Desert, southern California, from Whitewater south to Salton Sea (fig. 6).

Characters.—Size medium, hind foot 31 mm. in adult male topotype; tail long; ears small; color pale buffy gray or whitish; mammæ in 4 pairs, inguinal 2-2, pectoral 2-2.

Color.—Summer pelage: Upperparts buffy or cream color; ear patches dusky; nose and cheeks grayish brown; underparts, feet, and tail whitish, thinly haired. *Winter pelage:* Paler than in summer, upperparts creamy or whitish. *Young*, buffy gray.

Skull.—Rather light and slender, without conspicuous ridges or angles; zygomatic arches slender and parallel; nasals rather short, cuneate, truncate, or slightly emarginate at posterior tips; interparietal small and irregularly triangular, oval, or quadrate; bullæ short but full and rounded. *Dentition* rather light; incisors abruptly decurved.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 241; tail vertebræ, 84; hind foot, 31.5. Average of 4 topotypes (♀ ad.): 215, 78, 30. *Skull* (of topotype, ♂ ad.): Basal length, 37; nasals, 15; zygomatic breadth, 26; mastoid breadth, 21; interorbital breadth, 6.4; alveolar length of upper molar series, 7.7.

Remarks.—This very pale, desert species occupies the scattered moist oases in the hottest and driest of our deserts. Apparently its range is not continuous, as no gopher hills are to be found over wide areas of bare hot desert. The numerous colonies are to some extent isolated, and differences too slight for even subspecific recognition mark the specimens from almost every locality, but the main characters hold true over a wide area. Specimens from Carrizo Creek grade toward the more robust form *albatus* of the Colorado River bottoms on the California side, west of Yuma. A small series from Salt Creek, north of the Salton Sea, seem to go better with *perpallidus* than with any of the other three forms to which they might almost as well be referred. Direct intergradation is shown with *perpes* and through it with *griseus* and *aureus*.

The *aureus* group as heretofore considered now becomes the *perpallidus* group and includes *perpallidus, albatus, chrysonotus, perpes, canus, aureus, apache, cabezonæ, operarius*, and probably also *latirostris, cervinus*, and *sinaloæ*.

Specimens examined.—Total number, 68, as follows:

California: Agua Dulce, 1; Baregas Spring (8 miles east), 5; Colorado Desert (no specific locality), 5; Fish Spring, 2; Mission Creek, 1; Palm Springs, 35; Salt Creek (Riverside County), 8; Salton Sea (west side), 1; Whitewater, 10.

THOMOMYS PERPALLIDUS ALBATUS Grinnell.

White Pocket Gopher.

(Pl. V, fig. 1.)

Thomomys albatus Grinnell, Univ. of Cal., Publ. Zool., X, 172, 1912.

Type.—Collected on west side of Colorado River at old Haulon Ranch near Pilot Knob, Imperial County, California, by J. Dixon, May 7, 1910. Type specimen in Mus. Vert. Zool., Univ. of California.

Distribution.—Southeastern California and northeastern Lower California from Carrizo Creek south to Gardner's Lagoon, Salton River (fig. 6).

Characters.—Size considerably larger than *perpallidus;* color lighter; ears small; tail long; feet stout; mammæ in 4 pairs.

Color.—Summer pelage (May and June): Upperparts pale buff or cream color; nose and ears grayish brown; underparts white or creamy with little or no plumbeous base to fur; feet and tail almost naked but with scattered short white hairs. *Winter pelage*: Practically as in summer, but with more evident plumbeous base to fur on belly. *Young:* Less buffy, more grayish white.

Skull.—In old males rather heavy, ridged, and angular, widest at anterior angle of zygomata; rostrum short and heavy; incisors not so abruptly decurved as in *perpallidus;* bullæ full and rounded; occiput rather sloping, not so abruptly truncate as in *aureus* and *perpes.*

Measurements.—Type (♂ ad.): Total length, 272; tail vertebræ, 100; hind foot, 35. Topotype (♂ ad.): 264, 91, 34. Topotype (♀ ad.): 229, 79, 34. *Skull* (of type): Basal length, 41.5; nasals, 15; zygomatic breadth, 28; mastoid breadth, 22; interorbital breadth, 6.8, alveolar length of upper molar series, 8.5. Skull of old female: 38, 13.5, 25, 21, 6.5, 7.7.

Remarks.—This is a robust gopher very close to *perpallidus* in color, but in size and skull characters close to *aureus.* It occupies the moist, white, river sand of the flats where there is an abundant food supply. Specimens from Carrizo Creek are not typical but nearer *albatus* than *perpallidus.* Others from Baregas Spring and west of the Salton Sea are nearer *perpallidus.*

Specimens examined.—Total number, 72, as follows:

California: Carrizo Creek, 18; Colorado River bottoms opposite Yuma, 37; Salt Creek (Imperial County), 11; Salton Sea (Imperial County), 6.

Lower California: Salton River (Gardners Lagoon), 1.

THOMOMYS PERPALLIDUS CHRYSONOTUS Grinnell.

Yellow-Backed Pocket Gopher.

Thomomys chrysonotus Grinnell, Univ. of Cal., Publ. Zool., X, 174, 1912.

Type.—Collected at Ehrenburg, Arizona, (on dry mesa back from river bottoms), by F. Stephens, March 27, 1910. Type specimen in Mus. Vert. Zool., Univ. of California.

Distribution.—Southwestern Arizona and northwestern Sonora, from Ehrenberg south to near mouth of Colorado River, and east to Quitobaquito (figs. 7 and 8).

Characters.—Size smaller than *perpallidus*; ears minute; skull shorter, and bullæ more globose; color about the same; mammæ in 4 pairs.

Color.—Summer pelage: Upperparts bright to pale buff; ears brown or dusky at tips; postauricular patch generally inconspicuous; nose brownish; underparts and well up on sides whitish with pale plumbeous base of hair; feet and tail thinly clothed with short white hairs. *Winter pelage:* More grayish, fading to very pale buff in early spring.

Skull.—Short and wide; rostrum relatively shorter and wider than in *perpallidus*; bullæ fuller and more rounded; upper incisors more abruptly decurved; premaxillæ in type ending approximately even with posterior tip of nasals, but in the majority of specimens extending well back of nasals; interparietal small and nearly triangular; pterygoids short, thick, low, and wide apart.

Measurements.—Type (♂ ad.): Total length, 217; tail vertebræ, 73; hind foot, 30. Adult female from Yuma, Ariz.: 203, 65, 27. *Skull* (of type): Basal length, 33.5; nasals, 13.5; zygomatic breadth, 23; mastoid breadth, 19; interorbital breadth, 7; alveolar length of upper molar series, 8.

Remarks.—This seems to be a dry-mesa form more nearly agreeing with typical *perpallidus* than with the more robust *albatus* of the moist bottoms just across the Colorado River. Originally I identified the type for Dr. Grinnell as *perpallidus*, but since that time he has collected a fine series of topotypes of *perpallidus* at Palm Springs, which show better diagnostic characters than do the series in the National Museum collection, and fully warrant the separation of the form ranging in the dry hot desert east of the Colorado River in southwestern Arizona and northwestern Sonora.

Specimens examined.—Total number, 25, as follows:

Arizona: Ehrenburg, 1; Monument No. 204, east side of Colorado River, 1; Quitobaquito, 2; Tacna, 1; Tule Wells (in Tule Mountains near Sonora line), 5; Yuma, 12.

Sonora: Cienega Well, 2; Mesa on east side of Colorado River, 20 miles below the Arizona line, 1.

THOMOMYS PERPALLIDUS PERPES Merriam.

Lone Pine Pocket Gopher.

(Pl. V, fig. 3.)

Thomomys aureus perpes Merriam, Proc. Biol. Soc. Washington, XIV, 111, July 19, 1901.

Thomomys scapterus Elliot, Field Columb. Mus., zool. ser. III, 248, 1903. Type collected by E. Heller, in Hanopee Canyon, Panamint Mountains, California. Type specimen in Field Mus. Nat. Hist.

Type.—Collected at Lone Pine, Owens Valley, Inyo County, California, by E. W. Nelson, December 23, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Upper Sonoran desert valleys and mountain slopes of eastern California, from near head of Owens Valley south to Hesperia and Morongo Valley, into the valley of Kern River, and east to the Providence Mountains, Cal., and the Grapevine Mountains, Nev. (fig. 6).

Characters.—About the size of *perpallidus* or slightly smaller, with shorter tail, larger ears, slenderer skull, and brighter, stronger color; smaller and grayer than *aureus;* mammæ in 4 pairs.

Color.—Summer pelage: Upperparts bright buffy ochraceous; nose grayish brown; ear patch dusky; underparts buffy or creamy white; throat often pure white; feet and tail thinly covered with short silvery hairs. *Winter pelage:* Upperparts duller, darker, and more grayish buff. *Young,* very similar to adults.

Skull.—Slender and light with rarely a trace of lateral ridges; well arched; narrower and slenderer than in *perpallidus,* with especially slenderer rostrum; palate slightly more arched than in *perpallidus,* much less arched than in *aureus;* interparietal generally quadrate; bullæ full and rounded; nasals slightly emarginate or occasionally truncate. *Dentition* rather light; upper incisors decurved at right angles to axis of skull.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 215; tail vertebræ, 66; hind foot, 28.7. Average of 5 topotypes (♀ ad.): 210, 67, 28.5. *Skull* (of type): Basal length, 33; nasals, 12.3; zygomatic breadth, 22; mastoid breadth, 18.6; interorbital breadth, 6.5; alveolar length of upper molar series, 7.5.

Remarks.—This small gray form of the *perpallidus* group occupies Upper Sonoran desert valleys and slopes of eastern California. In parts of the Mohave Desert where it extends down into Lower Sonoran valleys it becomes slightly larger and paler than normal and might almost as well be placed with *aureus;* while in the foothills of the Sierra Nevada, San Gabriel, and San Bernardino Mountains it becomes slightly darker than the typical form and may grade into *awahnee.* It does not occur in Death Valley or Panamint Valley,

and gives place to *operarius* in the bottom of Owens Valley, and to *aureus* in Ash Meadows and the Amargosa Valley. Its connection with *perpallidus* on the south has been fully established by recent collections, so that both *perpes* and *aureus* must stand as subspecies of this earliest-described form of the desert group. *Thomomys scapterus* of Elliot proves to be typical of *perpes*.

Specimens examined.—Total number, 344, as follows:

California: Ash Creek (west of Owens Lake), 1; Barstow, 16; Benton Station, 4; Bishop, 1; Cactus Flat, 1; Carroll Creek, 1; Copper City, 1; Coso, 19; Cushenbury Spring, 2; Daggett, 2; Fairmont, 1; Granite Spring, 1; Grapevine Ranch, 3; Haway Meadows (south of Owens Lake), 2; Hesperia, 1; Independence, 13; Independence Creek, 2; Inyo Mountains, 1; Isabelle, 6; Kern River (South Fork, near Onyx), 17; Lone Pine, 64; Lone Willow Spring, 7; Ludlow, 2; Maturango Spring, 1; Mohave River, 4; Morongo Pass, 1; Mount Waterman (north slope in San Gabriel Mountains), 1; New York Mountain (in Providence Range), 1; Orogrande, 16; Panamint Mountains (Johnson Canyon, Perognathus Flat, Coal Kilns, Hanopee Canyon, head of Willow Creek, and Cottonwood Creek), 23; Resting Spring, 24; Tuttle Creek, 5; Twelve Mile Spring, 1; Victorville, 26; Walker Pass, 28; Warrens Ranch (in Morongo Valley), 1; Warrens Well (east of Morongo Valley), 2; Weldon, 37; White Mountains (pass between Deep Spring and Owens Valley), 1.

Nevada: Grapevine Mountains, 3; Thorps Mill, 1.

THOMOMYS PERPALLIDUS CANUS Bailey.

Gray Pocket Gopher.

(Pl. V, fig. 6.)

Thomomys canus Bailey, Proc. Biol. Soc. Washington, XXIII, 79, May 4, 1910.

Type.—Collected at Deep Hole, at north end of Smoke Creek Desert, Nevada, by Clark P. Streator, May 14, 1896. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Valleys of western and central Nevada, from Flowing Springs, western Humboldt County, south to Cloverdale and Monitor Valley, west to Honey Lake, Cal. (fig. 5).

Characters.—Considerably larger than *perpallidus*, with larger ears and shorter tail; size of *aureus* or a little larger; hind foot 30–33 mm.; colors buffy gray; skull wide, palate flat, not arched between molar series; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Upperparts pale buffy gray with dusky ear patch and brownish nose; underparts, feet, and tail whitish. The remnant of a more yellowish pelage on the rump of a topotype collected May 16 would indicate a darker winter pelage, while an old female collected at Amadee July 24 is coming into a still more ashen gray pelage.

Skull.—Much heavier and wider than that of *perpallidus;* like that of *aureus* but lower and wider with flat instead of arched palate; interparietal larger and more quadrate; bullæ slightly larger; anterior points of frontals less acute; lateral pits of palate deeper.

Measurements.—Type (♂ ad.): Total length, 242; tail vertebræ, 64; hind foot, 33. Average of 3 topotypes (♀ ad.): 216, 66, 30.3. *Skull* (of type): Basal length, 41; nasals, 15; zygomatic breadth, 28; mastoid breadth, 23; alveolar length of upper molar series, 9.

Remarks.—In color *canus* closely resembles the gray phase of its near neighbor *nevadensis*, but shows no relationship with it in cranial characters, while it does agree closely with the *perpallidus* group. It inhabits moist fertile soil of alkaline valleys, with many interruptions in range and some variation in characters. Specimens from Cloverdale, Peavine, and Monitor Valley, Nev., could almost as well be referred to *aureus*.

Specimens examined.—Total number, 43, as follows:

California: Amedee (Lassen County), 1; Fort Sage, 1.

Nevada: Carson River (Ragtown), 2; Carson Sink, 2; Cloverdale, 7; Deep Hole, 5; Fallon, 3; Flowing Spring, 1; Granite Creek, 2; Monitor Valley, 1; Peavine, 4; Pyramid Lake (south end), 9; Smoke Creek, 4; Wadsworth, 1.

THOMOMYS PERPALLIDUS AUREUS Allen.

YELLOW POCKET GOPHER.

(Pl. II, fig. 4; Pl. V, fig. 5.)

Thomomys aureus Allen, Bul. Am. Mus. Nat. Hist., V. 49, Apr. 28, 1893.

Type.—Collected at Bluff, San Juan County, Utah, by Charles P. Rowley, May 12, 1892. Type specimen in Am. Mus. Nat. Hist.

Distribution.—Desert region of southern Nevada, southern Utah, western Colorado, central and northwestern New Mexico, and northern and western Arizona (fig. 8).

Characters.—Size rather large; hind foot 29–32 mm.; ear relatively small; color golden buff; skull heavy, long, high, and narrow, with palate greatly arched between the molar series; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.— *Winter pelage:* Upperparts beautiful orange-buff, varying to paler and darker shades and sometimes with a wash of dusky along the back; ear patch and nose blackish in the darker and slightly dusky in the lighter individuals; underparts, feet, and tail creamy white. *Summer pelage:* Slightly darker. *Young*, more grayish.

Skull.—Long and narrow, with light lateral ridges parallel or sometimes nearly meeting in a sagittal crest in extreme old age; outline of palate strongly arched; bullæ full and rounded; interpterygoid fossa normally U-shaped with a central point or spicule extending from median ridge of palate; nasals cuneate and usually truncate posteriorly. *Dentition* heavy; upper incisors abruptly decurved at right angles to skull.

Measurements.—Average of 5 old male topotypes: Total length, 240; tail vertebræ, 73; hind foot, 31. Average of 5 old females: 224, 78, 30. *Skull* (of topotype, ♂ ad.):[1] Basal length, 42; nasals,

[1] No. 57162, U. S. Nat. Mus.

17; zygomatic breadth, 27; mastoid breadth, 22; interorbital breadth, 7; alveolar length of upper molar series, 9.

Remarks.—The subspecies *aureus* is an Upper and Lower Sonoran desert form occupying the bottoms of open sandy valleys, many of which are separated by mountainous or rough country in which the subspecies does not occur. In almost every valley slight variations of characters can be detected, but in none do they become so marked as to require recognition by name. In eastern California this form grades into the smaller *perpes*, which is mainly Upper Sonoran in range, while *aureus* occupies the Lower Sonoran valleys. On the south it evidently grades into *albatus* along the Colorado River bottoms, and thence into *perpallidus* of the Colorado Desert. Two specimens from Wickenburg, Ariz., are referred with some hesitation to *aureus*. Series of specimens from Manti and the Pine Valley Mountains, Utah, are by no means typical but may be called *aureus* rather than *perpes*. In New Mexico the subspecies reappears in the Rio Grande Valley from Bernalillo to San Marcial, and while growing darker to the southward is perfectly typical of *aureus* at Albuquerque.

Specimens examined.—Total number, 306, as follows:

Arizona: Chin Lee, 2; Jacobs Pool, 4; Keams Canyon, 6; Parker, 16; Wickenburg, 2.

California: Amargosa River (near Nevada line), 3.

Colorado: Ashbaugh Ranch, 1; Coventry, 8; Grand Junction, 1; Los Pinos, 1; Mesa Verde, 1.

Nevada: Ash Meadows, 51; Charleston Mountains (east base), 4; Colorado River (head of Black Canyon), 1; Oasis Valley, 3; Pahranagat Valley, 1; Pahrump Valley, 23; St. Thomas, 5; Vegas Valley, 10.

New Mexico: Acoma, 2; Albuquerque, 4; Bear Spring Mountains, 6; Belen, 6; Bernalillo, 4; Chusca Mountains (west slope), 1; El Vado (Chama River Valley), 1; Fruitland, 4; Gallina (Chama River Valley), 1; Gallup, 2; Juan Tofoya, 2; Laguna, 4; Riley, 4; San Augustine Plain (12 miles northwest of Monica Spring), 6; San Marcial, 5; Shiprock, 2; Socorro, 13; Wingate, 1.

Utah: Bluff (San Juan County), 48; Hanksville, 6; Hebron, 1; Henry Mountains, 3; Kanab, 4; Manti, 13; Mountain Meadows, 2; Pine Valley, 4; Pine Valley Mountains, 7; St. George, 5; Santa Clara, 2.

THOMOMYS PERPALLIDUS APACHE Bailey.

JICARILLA POCKET GOPHER.

(Pl. IV, fig. 6.)

Thomomys apache Bailey, Proc. Biol. Soc. Washington, XXIII, 79, May 4, 1910.

Type.—Collected at Lake La Jara (7,500 feet altitude) on the Jicarilla Apache Indian Reservation, N. Mex., by James H. Gaut, September 19, 1904. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Transition Zone in northeastern Arizona, northwestern New Mexico, and southwestern Colorado (fig. 7).

Characters.—Size large, hind foot 33–34 mm.; color dark; hind feet and tip of tail conspicuously white; mammæ in 4 pairs.

Color.—Upper and under parts nearly uniform dull sooty gray slightly washed with dull ochraceous; back with an ill-defined stripe of blackish from tip of nose to base of tail; basal half to three-quarters of tail brownish or blackish, the rest abruptly white; hind feet white; lips usually and chin rarely white. *Young:* One half-grown individual is lighter, more buffy, with white belly.

Skull.—Similar in form and general characters to that of *aureus;* bullæ full and rounded; pterygoids U-shaped, with spicule point of palatal ridge; nasals normally slightly emarginate with doubly rounded posterior tips, instead of normally truncate as in *aureus,* or widely emarginate as in *fulvus.* *Dentition:* Upper incisors white-tipped and decurved at nearly right angles to axis of skull.

Measurements.—Type (♂ ad.): Total length, 229; tail vertebræ, 74; hind foot, 34. Topotype (♀ ad.): 229, 74, 33. *Skull* (of type): Basal length, 41; nasals, 14; zygomatic breadth, 28; mastoid breadth, 23; alveolar length of upper molar series, 8.5.

Remarks.—This is a large, dark form of the *perpallidus* group with conspicuous markings, but with cranial characters close to those of *aureus.* It seems to be a dark local Transition Zone form of the yellow *aureus* of the surrounding valleys.

Specimens examined.—Total number, 36, as follows:

Arizona: Canyon de Chelly (7 miles above mouth), 1; Fort Defiance (sawmill 12 miles northwest), 2.

Colorado: Arboles, 1; Bayfield, 1.

New Mexico: Boulder Lake, 4;[1] Chama River (near Gallina), 1 (not typical); Chusca Mountains (around lakes at top of range, 8,000–9,000 feet altitude), 13; Lake La Jara, 2;[1] Stinking Lakes, 11.[1]

THOMOMYS CABEZONÆ Merriam.

Cabezon Pocket Gopher.

(Pl. V, fig. 8.)

Thomomys cabezonæ Merriam, Proc. Biol. Soc. Washington, XIV, 110, July 19, 1901.

Type.—Collected at Cabezon, San Gorgonio Pass, California, by Clark P. Streator, June 3, 1893. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—San Gorgonio Pass, southern California, south to Cabezon (fig. 6).

Characters.—Size medium, hind foot 30 mm.; ears rather large; color dull ochraceous; skull long and narrow.

Color.—Summer pelage: Upperparts dull ochraceous, varying from buffy ochraceous to dull brownish; ear patch black; nose and lips dusky or plumbeous; underparts creamy white to buffy or salmon. In 8 of 10 topotypes collected in June, a paler, more buffy gray pelage (probably winter) is disappearing on the rump.

[1] On the Jicarilla Apache Indian Reservation in northern New Mexico.

Skull.—Long, narrow, and slender, with nearly parallel lateral ridges; zygomata parallel or slightly wider anteriorly; nasals long and narrow; interparietal rectangular or oval, wider than long in immature skulls; pterygoids long, low, and thin, with rounded symphysis.

Measurements.—Average of 7 male topotypes: Total length, 221; tail vertebræ, 79; hind foot, 30. Average of 3 female topotypes: 208, 71, 28.7. *Skull* (of type): Basal length, 35; nasals, 14.5; zygomatic breadth, 23; mastoid breadth, 18; alveolar length of upper molar series, 7.

Remarks.—*Thomomys cabezonæ* seems to be a local form not closely connected with surrounding species. From *perpallidus*, its nearest neighbor on the east, and *pallescens* on the west, it is sharply differentiated. In general appearance it most nearly resembles *perpes*, from which it differs strikingly in large ears and in many cranial characters. Two specimens from Whitewater show an overlapping of range with *perpallidus*, but Gaut reports *cabezonæ* in irrigated fields, and *perpallidus* in the sagebrush. A single specimen of *nigrescens* from 2,500 feet altitude near Banning, and 7 specimens of *cabezonæ*, show a meeting or overlapping of ranges along the edge of the valley. The narrow braincase suggests relationship with *jacinteus*, and with *neglectus* of which it may be a pale valley form.

Specimens examined.—Total number, 55, as follows:

California (southern): Banning, 12; Cabezon, 27; Schains Ranch (4,500 feet altitude), 4; Snow Creek (near Whitewater), 2; Whitewater, 10.

THOMOMYS OPERARIUS Merriam.

Owens Lake Pocket Gopher.

(Pl. V, fig. 4.)

Thomomys operarius Merriam, Proc. Biol. Soc. Washington, XI, 215, July 15, 1897.

Type.—Collected at Keeler, California, on east side of Owens Lake, at 3,600 feet altitude, by E. W. Nelson, November 29, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Known only from type locality (fig. 6).

Characters.—Size medium, hind foot 30 mm.; color rich buff; skull short and wide; mammæ in 4 pairs.

Color.—Upperparts rich buff or pale ochraceous; ear patch gray or plumbeous; underparts, feet, and tail creamy white. *Young*, more grayish.

Skull.—Short and wide with short, heavy rostrum; zygomata abruptly spreading; upper incisors sharply decurved or slightly incurved; maxillaries short and heavy.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 223; tail vertebræ, 69; hind foot, 30.6. Average of 5 females: 217, 66, 29.6. *Skull* (of type): Basal length, 38; nasals, 13.5; zygomatic

breadth, 26.7; mastoid breadth, 21.5; interorbital breadth, 7; alveolar length of upper molar series, 8.5.

Remarks.—*Thomomys operarius* seems to be a very local form, quite distinct from *perpes*, by which its range is closely surrounded, but more nearly resembling *albatus* in short rostrum and heavy skull, and *aureus* in color. While clearly of the *perpallidus* group, it seems not to have direct connection with any of the forms and may well stand as described, a full species. It is confined to the sandy alkaline soil along the east side of Owens Lake.

Specimens examined.—Seventy-nine, from type locality.

THOMOMYS LATIROSTRIS Merriam.

Painted Desert Pocket Gopher.

(Pl. V, fig. 7.)

Thomomys latirostris Merriam, Proc. Biol. Soc. Washington, XIV, 107, July 19, 1901.

Type.—Collected at Little Colorado River, Painted Desert, Arizona (at Tanners Crossing, northeast of San Francisco Mountain), by C. Hart Merriam and Vernon Bailey, September 22, 1899. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Painted Desert, Ariz. (fig. 8).

Characters.—Size medium, hind foot 33 mm.; skull flattened; rostrum short and broad; ears very small; color orange-buff, much as in *aureus*.

Color.—Upperparts bright buffy yellow or pale orange-buff, without trace of black-tipped hairs; ears dusky; nose grayish brown; underparts, feet, and tail white, with a tinge of sulphur yellow stain on belly of type. *Young*, slightly less yellow, more buffy.

Skull.—Narrow and flat, with wide, flat rostrum; nasals narrow in the middle, spreading anteriorly; premaxillæ unusually wide at base of rostrum; incisors abruptly decurved at right angles to axis of skull; interparietal broadly pentagonal; bullæ small, about as in *fulvus;* basioccipital wide, flat, and keeled.

Measurements.—Type (♂ ad.): Total length, 232; tail vertebræ, 79; hind foot, 33. *Skull* (of type): Basal length, 39; nasals, 14; zygomatic breadth, 26; mastoid breadth, 21; alveolar length of upper molar series, 8.

Remarks.—While unique in characters, *latirostris* can best be placed in the group with *aureus* (*perpallidus*), with which it agrees in abruptly decurved incisors and U-shaped pterygoids. It is evidently an isolated form of restricted range. The type specimen was caught in the sand dunes in the Painted Desert along the Little Colorado River at Tanners Crossing, between Black Tank and Moencopie. It is a very old male in thin summer pelage, a worn and faded portion of which is disappearing over the posterior half of the body,

while a new, bright coat is replacing it over the anterior half. An immature female taken at Tuba, August 16, 1909, by Clarence Birdseye, is the only other known specimen. The distinguishing characters of the species are maintained in this young specimen, which disproves the idea that the type was abnormal. Two skulls of immature females without skins, from Winslow, do not possess characters sufficiently well marked for satisfactory determination, but are provisionally referred to *latirostris*. Apparently this is a Painted Desert form somewhat related to *aureus*.

Specimens examined.—Total number, 4, as follows:

Arizona: Painted Desert, 1; Tuba, 1; Winslow, 2.

THOMOMYS CERVINUS Allen.

Phœnix Pocket Gopher; Fawn-Colored Pocket Gopher.

(Pl. VI, fig. 2.)

Thomomys cervinus Allen, Bul. Am. Mus. Nat. Hist., VII, 203, June 29, 1895.

Type.—Collected at Phœnix, Arizona, by J. Diefenbach, October 20, 1894. Type specimen in Am. Mus. Nat. Hist.

Distribution.—Upper Gila Valley, Ariz. (figs. 7 and 8).

Characters.—Size large, hind foot 33–36 mm.; color pale fawn; skull heavy, ridged, and angular; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts pale fawn, with conspicuously blackish ear patch; nose and cheeks brown or blackish; underparts, feet, and tail a still paler shade of fawn; lining of cheek pouches white. *Young*, with whitish bellies.

Skull.—Long and narrow, as in *aureus;* palate only slightly arched; bullæ large and truncate instead of smoothly rounded anteriorly; pterygoids variable, narrowly constricted or wide apart, with thickened margins, and often inclosing a postpalatal spicule.

Measurements.—Average of 3 topotypes (♂ ad.): Total length, 253; tail vertebræ, 84; hind foot, 34.6. Average of 5 topotypes (♀ ad.): 245, 77, 34. *Skull* (of topotype, ♂ ad.):[1] Basal length, 42; nasals, 15.5; zygomatic breadth, 28; mastoid breadth, 20.5; interorbital breadth, 6.5; alveolar length of upper molar series, 8.

Remarks.—This is evidently a large form of the *perpallidus* group, occupying the Gila Valley. From *albatus* of the Colorado River valley it differs in darker color and longer, slenderer skull and rostrum. It also suggests relationship with the *fulvus* group through *toltecus* of the valleys farther east.

Specimens examined.—Total number, 19, as follows:

Arizona: Phœnix, 16; Sacaton, 1; Tempe, 2.

[1] No. 23707, U. S. Nat. Mus.

THOMOMYS SINALOÆ Merriam.

Sinaloa Pocket Gopher.

(Pl. IV, fig. 7.)

Thomomys sinaloæ Merriam, Proc. Biol. Soc. Washington, XIV, 108, July 19, 1901.

Type.—Collected at Altata, Sinaloa, Mexico (altitude 10 feet above sea level), by E. A. Goldman, March 28, 1899. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Western Sonora and Sinaloa, from Hermosillo south to Albata (fig. 7).

Characters.—Size rather large, hind foot 30–32 mm.; tail long; pelage thin; color bright tawny; skull heavy, wide, and angular; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Upperparts bright tawny or dull chestnut with a trace of dusky along back; underparts plain light tawny; nose grayish brown; feet and tail half-naked, half-covered with buffy hairs. *Young*, paler, more buffy. Summer and winter colors not very different.

Skull.—Heavy, wide, and angular; rostrum wide; nasals short and normally truncate posteriorly; zygomata abruptly spreading; bullæ full and rounded; basioccipital narrow between bullæ. *Dentition* heavy; incisors abruptly decurved.

Measurements.—Type (♂ ad.): Total length, 233; tail vertebræ, 73; hind foot, 31. Average of 3 topotypes (♂ ad.): 228, 75, 31.5. Average of 3 adult females: 214, 73, 31.3. *Skull* (of type): Basal length, 39.5; nasals, 14.5; zygomatic breadth, 28.3; mastoid breadth, 22; interorbital breadth, 6.2; alveolar length of upper molar series, 8.2.

Remarks.—Despite fulvous coloration the closest affinities of this form appear to be with the *perpallidus* group. From its nearest relative, *cervinus*, it differs in thin pelage, darker coloration, and short wide skull. Two small females from Magdalena, Sonora, are not typical and can only provisionally be referred to this species.

Specimens examined.—Total number, 22; as follows:

Sinaloa: Altata, 6.
Sonora: Camoa, 11; Hermosillo, 2; Magdalena, 2; Ortiz, 1.

Thomomys fulvus Group.

THOMOMYS FULVUS FULVUS (Woodhouse).

Fulvous Pocket Gopher.

(Pl. VI, fig. 1.)

Geomys fulvus Woodhouse, Proc. Acad. Nat. Sci., Philadelphia, VI, 201, 1852.
Thomomys fulvus Baird, Mamm. N. Am., 402, 1857.

Type.—Collected on San Francisco Mountain, Arizona, by Dr. S. W. Woodhouse, October, 1851. Type specimen in U. S. Nat. Mus.

Distribution.—Transition Zone in northern and central Arizona from the Trumbull Mountains to the White Mountains; east in New

Mexico to Sierra Grande, and the White and Guadalupe Mountains; north to Fisher Peak, southeastern Colorado (fig. 7).

Characters.—Size medium; hind foot 28–30 mm.; color dark tawny or dull chestnut; ears and claws medium; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts clear dark tawny or light chestnut, often dusky or blackish along back; ear patch, nose, and cheeks dusky or blackish; underparts lighter; chin, lining of cheek pouches, and feet usually white or whitish; tail tawny or dusky above, grayish below. *Winter pelage:* Duller darker tawny, more uniformly dusky above. *Young* very similar to adults.

Skull.—Heavier and relatively wider than in the *fuscus* or *fossor* groups; lighter and slenderer than in *perpallidus* or *aureus*. Lateral ridges slightly developed and approximately parallel at all ages; nasals broadly emarginate posteriorly; bullæ medium; basioccipital broadly triangular; pterygoid fossa normally V-shaped. *Dentition:* Incisors not projecting beyond tip of nasals; distinctly grooved.

Measurements.—Old male topotype: Total length, 231; tail vertebræ, 74; hind foot, 30. Average of 5 male topotypes: 219, 70, 30. Average of 5 female topotypes: 209, 66, 29.2. *Skull* (of topotype, ♂ ad.):[1] Basal length, 36; nasals, 15; zygomatic breadth, 24; mastoid breadth, 19; interorbital breadth, 6; alveolar length of upper molar series, 8.

Remarks.—The typical subspecies of *Thomomys fulvus* seems to occur only in the Transition Zone, above which it rarely extends and below which it extends mainly in modified forms, several of which have been separated. The name *fulvus* stands not only for a species with its six subspecies, but for the center of a widely distributed group, including *mearnsi*, *baileyi*, and *lachuguilla*. Its relationship with the *bottæ* group of the west coast is genetically close but geographically the two are widely separated. If connected with the *perpallidus* group it is through *toltecus* and *cervinus*, but this connection seems doubtful and by no means close.

Specimens examined.—Total number, 305, as follows:

Arizona: Aubrey (10 miles south of Pine Spring, 6,000 feet altitude), 2; Beaver Creek (near Fort Verde), 1; Bill Williams Mountain, 2; Blue (Greenlee County, 6,000 feet), 2; Bradshaw City, 17; Flagstaff, 2; Fort Verde, 5; Fort Whipple, 2; Fossil Creek, 3; Grand Canyon (Canyon Spring), 1; Little Spring (18 miles northwest of Flagstaff), 1; Pine Spring (5 miles north, 7,000 feet), 1; Prescott, 7; Prieto Plateau (south end Blue Range, Greenlee County, 7,500–9,000 feet), 6; San Francisco Mountain, 20; Springerville (7,000 feet), 29; Trumbull Mountains, 3; White Mountains, 3.

Colorado: Fisher Peak, 1.

[1] No. 24506, U. S. Nat. Mus.

New Mexico: Burro Mountains, 2; Capitan Mountains, 36; Chloride (10 miles east), 1; Cliff, 1; Clouderoft, 7; Clouderoft (10 miles north), 1; Coppermines, 1; Copperton, 6; Corona, 6; Carasal (Bernalillo County), 3; Datil Mountains, 7; Fairview, 1; Folsom, 2; Fort Wingate, 2; Gallina Mountains, 1; Gila, 5; Glenwood, 1; Guadalupe Mountains, 6; Halls Peak, 7; Head of Mimbres, 2; Hoskins Ranch (Colfax County), 2; Jicarilla Mountains, 5; Kingston (about 4 miles west, 9,500 feet altitude), 2; Long Canyon (3 miles north of Catskill), 1; Luna, 3; Luna (6 miles southwest, 7,000 feet), 5; Magdalena Mountains (Copper Canyon, 8,200 feet), 1; Magdalena Mountains (Water Canyon, 6,500 feet), 1; Manzano Mountains, 12; Mimbres River, 1; Mogollon Mountains, 7; Mora (10 miles south), 4; Mount Capitan (east base), 1; Pecos, 2; Pleasanton, 3; Quemado (10 miles southwest), 2; Raton Range (near Folsom), 3; Rio Alamosa (15 miles north of Ojo Caliente, 6,900 feet), 1; Ruidosa, 7; San Andres Mountains, 6; San Mateo Mountains (Monica Canyon, 8,000 feet), 2; San Pedro, 2; Sierra Grande, 4; Silver City, 12; Fort Stanton, 3; Fort Union, 1; Zuni Mountains, 5; Zuni River, 1.

THOMOMYS FULVUS PERVAGUS Merriam.

Espanola Pocket Gopher.

(Pl. IV, fig. 5.)

Thomomys aureus pervagus Merriam, Proc. Biol. Soc. Washington, XIV, 110, 1901.

Type.—Collected at Espanola, New Mexico, by J. Alden Loring, January 4, 1894. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Upper Rio Grande and San Luis Valleys in northern New Mexico and southern Colorado (fig. 8).

Characters.—Size large, hind foot 31–33 mm.; color lighter than in *fulvus;* skull longer and heavier; mammæ in 4 pairs.

Color.—Summer pelage: Upperparts plain bright tawny; nose, cheeks, and ear patch blackish; underparts paler tawny; feet whitish; tail dusky above, usually to tip. *Winter pelage:* Slightly duller above and below.

Skull.—As in *fulvus,* but longer, narrower, and with less-spreading zygomatic arches, and slightly larger audital bullæ; differing from *aureus* in less arched palate, emarginate nasals, and V-shaped pterygoids.

Measurements.—Type (♂ ad.): Total length, 244; tail vertebræ, 76; hind foot, 31. Average of 4 topotypes (♂ ad.): 239, 73, 32.3. Average of 5 females: 224, 68, 31.4. *Skull* (of type): Basal length, 42; nasals, 15.5; zygomatic breadth, 27; mastoid breadth, 21; alveolar length of upper molar series, 8.

Remarks.—In characters *pervagus* stands so nearly between *fulvus* and *aureus* as to suggest that it forms a connecting link between the two groups, but in a large number of specimens, collected since the species was described, the affinities are uniformly with *fulvus* instead of *aureus.* It is evidently a paler, more robust, Upper Sonoran valley form of *fulvus* inhabiting the upper Rio Grande and San Luis Valleys.

Specimens examined.—Total number, 50, as follows:

Colorado: Antonito, 8; Conejos River (6 miles west of Antonito), 2; Gardiner, 2; Salida, 9.

New Mexico: Abiquiu, 1; Arroyo Hondo, 4; Chama River Canyon (above Abiquiu), 1; Espanola, 8; Fort Burgwyn, 5; Questa, 4; Rinconada, 2; Santa Clara Canyon, 2; Santa Fe, 1;[1] Santa Fe (10 miles north), 1.

THOMOMYS FULVUS DESERTORUM Merriam.

Desert Pocket Gopher.

(Pl. VI, fig. 6.)

Thomomys desertorum Merriam, Proc. Biol. Soc. Washington, XIV, 114, July 19, 1901.

Type.—Collected at Mud Spring (10 miles southwest of Mineral Park, southern end of Detrital Valley), Arizona, at about 3,400 feet altitude in Lower Sonoran Zone, by Vernon Bailey, February 21, 1889. Type specimen in U. S. Nat. Mus., Merriam collection.

Distribution.—Detrital and Big Sandy Valleys, northwestern Arizona; east in the Grand Canyon to Prospect Valley (figs. 7 and 8).

Characters.—Size small, hind foot 26 mm.; color bright tawny; skull small, light, and smooth, with abruptly decurved incisors; sexes very similar; mammæ in 4 pairs.

Color.—Summer pelage: Upperparts rich orange-tawny, or orange-cinnamon, lighter and brighter than in *fulvus;* ear patch, nose, and cheeks dusky; underparts creamy white to light cinnamon; feet and tail soiled whitish or buffy. *Winter pelage:* Duller and more yellowish; upperparts bright cinnamon; underparts whitish to buffy ochraceous.

Skull.—Small and light, smoothly rounded, not ridged or angular; bullæ small, but full and rounded, not flattened and angular as in *fulvus*, nor large and prominent, as in *aureus;* basioccipital, as in *fulvus*, wide with sharp keel. *Dentition:* Incisors bent downward at right angles to axis of skull.

Measurements.—Type (♂ ad.): Total length, 200; tail vertebræ, 68; hind foot, 26. Average of 5 male topotypes: 195, 63, 26. Average of 4 female topotypes: 190, 60, 25.5 *Skull* (of type): Basal length, 33; nasals, 12; zygomatic breadth, 22; mastoid breadth, 17.5; alveolar length of upper molar series, 6.5.

Remarks.—The color of this little gopher in summer pelage suggests relationship to *fulvus*, but its cranial characters are so strongly marked that it was originally described as a species. It may, however, probably be considered a depauperate Lower Sonoran desert

[1] In the mammal collection of the Academy of Natural Sciences of Philadelphia is a mounted skin without skull (No. 145) of a typical *Thomomys pervagus.* It is labeled "Columbia River," but the label has been copied from the catalogue where originally no locality was indicated, and the locality of the preceding specimen has been given to it. This is evidently the specimen referred to (Proc. Acad. Nat. Sci. Phila., VI, 1852, p. 53, Pl. LXIV) as *Geomys rufescens*, donated by Col. Geo. A. McCall. McCall's specimens apparently were not labeled, but this collection of 70 mammals and bird skins was said to be from California and Oregon. As *pervagus* is neither a California nor an Oregon form, the specimen in question probably came from Santa Fe, N. Mex., where McCall was previously stationed.

form of the *fulvus* group, with a range corresponding to that of the creosote bush in the Detrital and Big Sandy Valleys, and extending well up into the Grand Canyon.

Specimens examined.—Total number, 34, as follows:

Arizona: Big Sandy Creek (at 2,000 feet altitude), 7; Dolans Spring, 7;[1] Grand Canyon (at 4,500 feet in lower end of Prospect Valley on Hualpai Indian Reservation), 4; Little Meadows (in Sacramento Valley), 2; Mineral Park, 3;[1] Mud Spring, 8;[1] Willow Spring, 3.[1]

THOMOMYS FULVUS INTERMEDIUS Mearns.

MOUNTAIN-TOP POCKET GOPHER.

(Pl. VI, fig. 5.)

Thomomys fulvus intermedius Mearns, Proc. U. S. Nat. Mus., XIX, 1897, 719, July 30, 1897.

Type.—Collected on summit of Huachuca Mountains (9,000 feet altitude) southern Arizona, by F. X. Holzner, September 6, 1893. Type specimen in U. S. Nat. Mus.

Distribution.—Upper slopes of mountains in southeastern Arizona and extreme southwestern New Mexico (fig. 8).

Characters.—Smaller than *fulvus*, with conspicuous black back and bright brown sides; skull small and slender; ears and claws medium; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Upperparts dark tawny shading into black along the back from nose to tail, in some specimens forming a broad and clear black band and in others indistinct and brownish black; underparts pale tawny; tail brown, with whitish tip; feet soiled whitish. May, August, and September specimens show practically the same coloration.

Skull.—Small and slender; zygomata very slender and strictly parallel; nasals narrow, deeply emarginate; bullæ small and flattened; basioccipital triangular; pterygoids thickened at base and with narrow fossa; interparietal small and generally triangular. *Dentition* light.

Measurements.—Type (♂ ad.): Total length, 200; tail vertebræ, 66; hind foot, 26. Adult male from Fort Huachuca: 200, 59, 27. Adult female from Fort Huachuca: 198, 62, 25. *Skull* (of type): Basal length, 34; nasals, 13; zygomatic breadth, 22; mastoid breadth, 18; interorbital breadth, 7; alveolar length of upper molar series, 6.5.

Remarks.—This small, black-backed form of the *fulvus* group has a wide and scattered range with considerable variation on the different mountains. On top of the Chiricahua Mountains it is a little larger than typical; on the crest of Animas Peak, a little smaller; on the

[1] In Detrital Valley.

Santa Catalina Mountains, slightly larger and darker. Variation in size corresponds somewhat with the extent of high mountain areas which the animals inhabit, the smallest specimens being from the very restricted summit of the Animas Mountains. The difference between those from the tops of the Animas and the Huachuca Mountains is slight, however, compared with that between specimens of *intermedius* from the summit and *toltecus* from the base of either range.

Specimens examined.—Total number, 63, as follows:

Arizona: Chiricahua Mountains, 22; Fly Park (at 9,000 feet altitude), 1; Graham Mountains (8,500 to 9,200 feet), 8; head of Rucker Canyon, 2; Huachuca Mountains (up to 9,000 feet), 19; Mount Graham, 3; Santa Catalina Mountains (8,000 feet), 6.

New Mexico: Animas Mountains (7,000 feet), 2.

THOMOMYS FULVUS TEXENSIS Bailey.

Davis Mountain Pocket Gopher.

(Pl. IV, fig. 4.)

Thomomys fulvus texensis Bailey, Proc. Biol. Soc. Washington, XV, 119, 1902.

Type.—Collected on Davis Mountains, Texas (head of Limpia Creek, at 5,500 feet altitude, in edge of Transition Zone), by Vernon Bailey, January 7, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Known only from type locality (fig. 7).

Characters.—Similar to *fulvus*, but smaller; hind foot 24–27 mm.; skull relatively narrower; color slightly lighter; mammæ in 4 pairs.

Color.—Summer pelage: Upperparts tawny-gray; underparts brighter clearer tawny; ear patch, nose, and cheeks blackish; feet and lips gray; lining of pouches white. *Winter pelage:* Slightly duller and darker than in summer.

Skull.—Light and slender, distinguished from that of *fulvus* by high narrow braincase, shallower lateral pits of palate, and shorter pterygoids.

Measurements.—Type (♂ ad.): Total length, 204; tail vertebræ, 63; hind foot, 26. Average of 5 topotypes (♂ ad.): 203, 65, 26.6. Average of 5 females: 187, 61, 25.8. *Skull* (of type): Basal length, 34.5; nasals, 13; zygomatic breadth, 22; mastoid breadth, 18; alveolar length of upper molar series, 7.

Remarks.—This is evidently a small local race of *fulvus*, as shown by similarity of skull characters and also by color and general characters. It is evidently isolated in the Transition Zone area of the Davis Mountains, but not widely separated from more nearly typical *fulvus* of the Guadalupe Mountains.

Specimens examined.—Twenty, from type locality.

THOMOMYS FULVUS TOLTECUS Allen.

Toltec Pocket Gopher.

(Pl. VI, fig. 3.)

Thomomys toltecus Allen, Bul. Am. Mus. Nat. Hist., V, 52, Apr. 28, 1893.

Type.—Collected at Colonia Juarez, Mexico (on the Casas Grandes River at about 4,500 feet altitude in northwestern Chihuahua), by F. Robinette,[1] 1890. Labeled "Juarez, N. Sonora." Type specimen in Am. Mus. Nat. Hist.

Distribution.—Lower Sonoran valleys and deserts of southeastern Arizona, southwestern New Mexico, and adjacent parts of Chihuahua and Sonora, south to Colonia Juarez, Chihuahua (fig. 7).

Characters.—Size about as in *fulvus* or slightly larger; colors paler and grayer; ears and claws medium; mammæ in 4 pairs.

Color.—Summer pelage (June specimens from Casas Grandes): Upperparts dull ochraceous-tawny; nose brownish; ear patch black; underparts lighter ochraceous-tawny; tail buffy gray; feet whitish. *Winter pelage:* Upperparts dark gray with a tawny suffusion over sides, and usually an indistinct dusky median line along back; nose and ear patch dusky; underparts light fawn or pinkish buff.

Skull.—Very like that of *fulvus* but more angular, less arched, with wider nasals, larger bullæ, and about the same dentition.

Measurements.—Adult male from Casas Grandes: Total length, 221; tail vertebræ, 72; hind foot, 31.5. Adult female from same locality: 205, 66, 29. *Skull* (of male): Basal length, 37; nasals, 13; zygomatic breadth, 25; mastoid breadth, 20.5; interorbital breadth, 7; alveolar length of upper molar series, 7.8. *Skull* (of type): 41, 14, 26, 21, 7, 8.

Remarks.—This is a light-colored valley form of the *fulvus* group occupying the upper edge of Lower Sonoran deserts of southern New Mexico and Arizona and northern Chihuahua. It is readily distinguishable from the smaller and grayer *lachuguilla* of the Rio Grande Valley, which occurs also at Casas Grandes and seems to be distinct. In Arizona it may grade into *cervinus* of the Gila Valley and in Sonora possibly into *sinaloæ*.

Specimens examined.—Total number, 175, as follows:

Arizona: Calabasas, 5; Chiricahua Mountains, 4; Dos Cabesas, 1; Fairbank, 24; Fort Bowie, 6; Fort Grant, 4; Fort Huachuca, 5; Fort Lowell, 12; Graham Mountains (Ash Creek, at 6,100 feet altitude), 3; Huachuca Mountains, 9; La Osa, 11; Mammoth, 1; Oracle, 2; Safford, 9; San Bernardino Ranch (Mexican boundary), 33; San Xavier, 1; Tucson, 2; Wilcox, 2.

Chihuahua: Casas Grandes, 2; Colonia Diaz, 3; Colonia Juarez, 6; Espia, 1.

New Mexico: Adobe Ranch (north base Animas Mountains), 1; Cuchillo, 1; Deming, 3; Garfield, 2; Hachita, 3; Lake Valley, 2; Las Palomas, 2; Mimbres River, 1; Monument No. 40, Mexican boundary, (upper corner, 100 miles west of El Paso), 3; Red Rock, 3.

Sonora: Santa Cruz River, 8.

[1] The original label bears the name F. Robinette, but in the original description A. D. Meed was given as the collector.

THOMOMYS MEARNSI Bailey.

Mearns Pocket Gopher.

(Pl. VI, fig. 4.)

Thomomys mearnsi Bailey, Proc. Biol. Soc. Washington, XXVII, 117, July 10, 1914.

Type.—Collected at Gray's Ranch in Animas Valley, southwest corner of New Mexico (about 20 miles north of the Mexican line), by E. A. Goldman, August 10, 1908. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Known only from type locality (fig. 7).

Characters.—Slightly smaller than *fulvus;* less dusky in color; skull short and wide with very slender, projecting incisors; ears medium; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—*Summer pelage:* Upperparts dull cinnamon or light tawny, with blackish nose and ear patches; underparts pale cinnamon; tail buffy gray; feet whitish. *Winter pelage:* Evidently more grayish as indicated by some worn patches of old long fur.

Skull.—Short and wide, with arched zygomata, short braincase, short rostrum, and protruding upper incisors; bullæ very short and round; pterygoids V-shaped; nasals short and truncate or slightly emarginate; anterior base of zygoma convex against frontal and premaxillæ. *Dentition:* Incisors very slender, pale, and protruding far beyond nasals; distinctly grooved.

Measurements.—Type: Total length, 220; tail vertebræ, 67; hind foot, 31. Topotype (♀ ad.): 201, 65, 29. *Skull* (of type): Basal length, 37; nasals, 12.4; zygomatic breadth, 26; mastoid breadth, 21.5; interorbital breadth, 6; alveolar length of upper molar series, 7.

Remarks.—This seems to be a local form in the bottom of the Animas Valley, somewhat resembling *nelsoni* but not of the *umbrinus* group. The four pairs of mammæ place it in the *fulvus* group, but it seems to be distinct from the surrounding *toltecus.* Specimens were taken around the moist edges of a large marsh on the Gray Ranch and the moist, alkaline soil may be the environmental factor that has produced a local form in the midst of wide deserts. It is quite probable that the form occupies similar situations all along the Animas and San Simon Valleys.

Specimens examined.—Four, from type locality.

THOMOMYS BAILEYI Merriam.

Sierra Blanca Pocket Gopher.

(Pl. VI, fig. 7.)

Thomomys baileyi Merriam, Proc. Biol. Soc. Washington, XIV, 109, July 19, 1901.

Type.—Collected at Sierra Blanca, El Paso County, Texas, by Vernon Bailey, December 28, 1889. The type and topotypes were caught all around the railway station where the Texas Pacific joins the Southern Pacific. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Sierra Blanca, western Texas, north to Tularosa, N. Mex. (fig. 7).

Characters.—Size medium, hind foot 29–32 mm.; color, dull ochraceous-tawny; skull short and wide with projecting incisors; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Fresh winter pelage: Upperparts dull ochraceous-tawny or buffy fulvous, with dusky ear patch and nose; underparts pale salmon or creamy white; tail buffy to the tip; feet soiled whitish. *Summer pelage:* Not represented.

Skull.—Short and wide, with greatly protruding incisors; basioccipital wide between the narrow bullæ; premaxillæ extending but slightly back of nasals; interparietal quadrate; anterior base of zygoma convex; coronoid process of mandible curved, and postcoronoid notch widely circular.

Measurements.—Topotype (♂ ad.): Total length, 215; tail vertebræ, 64; hind foot, 31. Average of five females: 212, 69, 29. *Skull* (of type): Basal length, 37; nasals, 17.7; zygomatic breadth, 26.5; mastoid breadth, 19; alveolar length of upper molar series, 7.5.

Remarks.—In wide skull and projecting incisors *baileyi* suggests the *umbrinus* group, but as no other detailed characters of the group appear the resemblance is evidently accidental. Nine specimens from Tularosa, N. Mex., average larger and darker colored than those of the type series, but show the prominent cranial characters. There is nothing to indicate that the species has a continuous range between these localities, but it is not improbable that it follows along the west base of the Sacramento Mountains in the Upper Sonoran or the upper edge of the Lower Sonoran Zone. The Tularosa specimens suggest a distant connection with the *fulvus* group.

Specimens examined.—Total number, 15, as follows:

New Mexico: Tularosa, 9.
Texas: Sierra Blanca, 6.

THOMOMYS LACHUGUILLA Bailey.

Lachuguilla Pocket Gopher.

(Pl. VI, fig. 8.)

Thomomys aureus lachuguilla Bailey, Proc. Biol. Soc. Washington, XV, 120, June 2, 1902.

Type.—Collected at El Paso, Texas (in a dry wash in the mountains a mile northeast of the town), by Vernon Bailey, September 24, 1901. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Arid Lower Sonoran mesas in extreme western Texas and southern New Mexico, south to Casas Grandes, Chihuahua (fig. 7).

Characters.—Size small, hind foot 27–29 mm.; color, dull ochraceous-tawny; skull narrow with abruptly decurved incisors; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Upperparts dull ochraceous-tawny or grayish buff; nose and ear patch dusky; underparts pale cinnamon to soiled whitish; feet whitish.

Skull.—Resembling that of *aureus* in general form, with full rounded bullæ, narrow basioccipital, and slightly arched palate, but differing in its smaller size, slenderer form, and less-ridged surface; interparietal normally quadrate; slender points of premaxillæ extending far back of truncate or slightly emarginate tip of nasals.

Measurements.—Type (♂ ad.): Total length, 215; tail vertebræ, 65; hind foot, 29. Average of five topotypes (♂ ad.): 202, 61, 27. Average of three females: 195, 62, 26. *Skull* (of type): Basal length, 35; nasals, 14; zygomatic breadth, 22; mastoid breadth, 19; alveolar length of upper molar series, 7.

Remarks.—This form needs no comparison with *baileyi* on the east or *perditus* on the south. It was originally, but probably erroneously, considered a small, dull-colored desert form of *aureus*. It occupies the arid Lower Sonoran mesas, but apparently does not occur in moist and fertile bottom lands as do the more robust *aureus* and *toltecus*. Specimens from Presidio County and the Great Bend region are not typical, but they vary so much with each locality that to avoid making more subspecies I have referred them to this, the nearest form. It seems probable that the great variation in the gophers of this region is due to the scarcity of individuals and the isolation of colonies.

Specimens examined.—Total number, 33, as follows:

Chihuahua: Casas Grandes, 2.
New Mexico: Organ, 2; Organ Mountains, 2.
Texas: Alpine, 1; Boquillas, 2; El Paso, 12; Franklin Mountain (10 miles north of El Paso, 4; and 15 miles north, 2), 6; Marathon (15 miles south), 1; Paisano, 1; Presidio County (35 miles south of Marfa), 4.

Thomomys umbrinus Group.

THOMOMYS UMBRINUS UMBRINUS (Richardson).

Southern Pocket Gopher.

(Pl. II, fig. 13; Pl. VI, fig. 13; text fig. 2.)

Geomys umbrinus Richardson, Fauna Boreali-Americana, I, 202, 1829.
Thomomys umbrinus Bailey, Proc. Biol. Soc. Washington, XIX, 3, Jan. 29, 1906.

Type.—In British Museum, said to have come from "Cadadaguios, a town in southwestern Louisiana," but no such town has ever been located, except the Kadhoadacho Indian settlements on the Red River, in western Louisiana, where *Thomomys* does not occur. The type locality is now restricted to Boca del Monte, Vera Cruz. Type identified with specimens from Vera Cruz.[1]

[1] Proc. Biol. Soc. Washington, XIX, 3, Jan. 29, 1906.

Distribution.—Known only from Boca del Monte and Xuchil, Vera Cruz (fig. 9).

Characters.—Size medium, hind foot 27–28 mm.; color dichromatic, dull umber, brown, or black; skull short and wide with emarginate anterior base of zygoma and strongly projecting incisors; groove on inner margin of incisors very obscure; ears small; claws very slender; mammæ in 3 pairs, inguinal 2–2, pectoral 1–1.

Color.—Upperparts in brown phase varying from dull burnt umber, or Prout's brown, to nearly black; underparts lightly washed with pale buff or whitish; chin, feet, and tip of tail white. In black phase, slaty black all over except white chin, feet, and tip of tail.

Skull.—Light and smooth, not ridged or angular, short and wide, with very short rostrum and greatly projecting incisors; anterior base of zygoma emarginate or concave in outline where it joins the frontal; lachrymal long and attached for all or most of its length to zygoma; premaxillæ widening posteriorly and terminating approximately even with nasals; palate flat, not arched between molar series; lateral pits deep; base of pterygoids constricted. *Dentition* light; incisors slender, projecting, pale or whitish, with indistinct or obsolete inner groove; anterior lower incisor with anterior enamel plate minute or often entirely wanting.

Measurements.—Average of 4 topotypes (♂ ad.): Total length, 193; tail vertebræ, 58; hind foot, 27.2. Average of 3 adult females: 195, 57, 27. *Skull* (♂ ad.):[1] Basal length, 33.7; nasals, 12.4; zygomatic breadth, 24; mastoid breadth, 17.6; alveolar length of upper molar series, 7.3.

Remarks.—It would be useless to list the various species of *Thomomys* to which authors have applied the name *umbrinus*. For over half a century the name was shifted about to one and another species, and proved a stumbling block to every naturalist working on the genus. Fortunately the type is still extant and has been identified with a sufficiently restricted species to give it a definite location. The species thus becomes the type of a well-defined group, including *umbrinus, orizabæ, peregrinus, nelsoni, sheldoni, goldmani, perditus,* and *atrovarius.*

Specimens examined.—Total number, 15, as follows:

Vera Cruz: Boca del Monte, 8; Xuchil, 7.

THOMOMYS UMBRINUS ORIZABÆ Merriam.

Orizaba Pocket Gopher.

(Pl. VI, fig. 15.)

Thomomys orizabæ Merriam, Proc. Biol. Soc. Washington, VIII, 145, Dec. 29, 1893.

Type.—Collected on Mount Orizaba (9,500 feet altitude), Puebla, Mexico, by E. W. Nelson and E. A. Goldman, April 25, 1903. Type specimen in U. S. Nat. Mus., Biological Survey collection.

[1] No. 66091, U. S. Nat. Mus., from Boca del Monte, Vera Cruz.

Distribution.—Known only from type locality (fig. 9).

Characters.—Considerably larger than *umbrinus* or *peregrinus;* hind foot 27–31 mm.; skull heavier; colors dichromatic, usually black, rarely bright umber; ears small; claws slender; mammæ in 3 pairs.

Color.—In 14 of 16 topotypes: Glossy iridescent black all over except white on tip of tail, toes, and usually chin and inside of pockets. Two topotypes in brown phase: Upperparts bright burnt umber in the adult, darker in the immature specimen; underparts washed with paler shade of the same or ochraceous-buff; tip of tail, toes, and inside of pockets white.

Skull.—Relatively more elongated, angular, and ridged than in *umbrinus* or *peregrinus;* base of zygoma deeply concave, or emarginate; lachrymal long and borne mainly on zygoma; premaxillæ widening posteriorly and terminating approximately even with nasals; palate flat between molars, but with deep lateral pits and constricted base of pterygoids. *Dentition* heavy; incisors less projecting than in *peregrinus*, and plain orange, rarely with white tips; anterior enamel plate of front lower incisor small.

Measurements.—Average of 4 topotypes (♂ ad.): Total length, 219; tail vertebræ, 69; hind foot, 29.3. Average of 5 females: 132, 66, 29. *Skull* (of type, ♀ ad.): Basal length, 35; nasals, 13; zygomatic breadth, 25; mastoid breadth, 19; alveolar length of upper molar series, 7.7. One topotype (♂ ad.):[1] 38.5, 14, 25, 19.5, 8.

Specimens examined.—Sixteen, from type locality.

THOMOMYS UMBRINUS PEREGRINUS Merriam.

Mexican Pocket Gopher.

(Pl. VI, fig. 14.)

Thomomys peregrinus Merriam, Proc. Biol. Soc. Washington, VIII, 146, Dec. 29, 1893.

Type.—Collected at Salazar, Federal District of Mexico, Mexico, at 10,300 feet altitude, by E. W. Nelson and E. A. Goldman, October 24, 1892. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Mountain slopes in the Federal District of Mexico, east to San Martin, Puebla, and north to El Chico, Hildago (fig. 9).

Characters.—Size medium, slightly larger than *umbrinus;* hind foot 27–29 mm.; color dark rich umber; skull with projecting incisors and concave base of zygoma; mammæ in 3 pairs.

Color.—Upperparts dark rich burnt umber, becoming blackish along the back in many specimens; underparts washed with ochraceous-buff; feet, tip of tail, and sometimes chin, whitish. A fully melanistic specimen from Santa Rosa, Guanajuato, suggests partial dichromatism.

[1] No. 53611, U. S. Nat. Mus.

Skull.—Less markedly short and wide than in *umbrinus* and with slightly less projecting incisors; base of zygoma slightly concave; palate flat between molar series, and unique in having shallow lateral pits and wide base of pterygoids. *Dentition* light; incisors bright orange with white tips; anterior enamel plate on front lower incisors small but distinct and constant.

Measurements.—Average of 3 topotypes (♂ ad.): Total length, 208; tail vertebræ, 61; hind foot, 28. Average of 5 females: 189, 59, 27.3. *Skull* (of type, ♀ ad.): Basal length, 34; nasals, 12; zygomatic breadth, 23; mastoid breadth, 18; alveolar length of upper molar series, 7. Skull of topotype (♂ ad.):[1] 34, 12.3, 24, 19, 7.

Specimens examined.—Total number, 43, as follows:

Hidalgo: El Chico (Sierra de Pachuca), 3; Real del Monte, 3; Tulancingo, 1.
Mexico: Popocatepetl, 1; Salazar, 17; Toluca Valley, 1; Volcan Toluca (north slope), 15.
Puebla: San Martin, 2.

THOMOMYS NELSONI Merriam.

Nelson Pocket Gopher.

(Pl. VI, fig. 11.)

Thomomys nelsoni Merriam, Proc. Biol. Soc. Washington, XIV, 109, July 19, 1901.

Type.—Collected at Parral, Chihuahua, Mexico, at 6,000 feet altitude, by E. W. Nelson and E. A. Goldman, September 18, 1898. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Central Chihuahua, from Gallego south to Parral (fig. 9).

Characters.—Size small, hind foot 28 mm.; color bright tawny; skull short and wide, with projecting incisors.

Color.—*Winter pelage:* Upperparts light russet or bright tawny, darker along back and on face; nose and ear patch blackish; ankle and base of tail brownish, lower part of feet and terminal part of tail white; belly pale tawny. *Summer pelage:* A shade brighter above and below.

Skull.—Short and wide with abruptly spreading zygomata and strongly projecting, lightly grooved, white-tipped incisors; nasals narrow, cuneate, slightly notched, and terminating a little short of the wide posterior tips of premaxillæ; basioccipital wide and flat; frontals wide, crowding slightly into base of zygomata; lachrymal mainly adnate to zygoma.

Measurements.—Type (♂ ad.):[2] Total length, 196; tail vertebræ, 60; hind foot, 28. Topotype (♂ ad.): 207, 59, 28.5. *Skull* (of type): Basal length, 37; nasals, 13; zygomatic breadth, 24; mastoid breadth,

[1] No. 50122, U. S. Nat. Mus.

[2] The type of *nelsoni* was marked "♀" on the original label and referred to in original description as female. It is, however, a fine old male with prominent sex marks showing in the skin and with the skull characters of the male.

21; alveolar length of upper molar series, 7. Skull of male topotype: 34, 12, 24, 19.5, 7.

Remarks.—The short, wide skull, projecting incisors, and white slippers and tip of tail reveal relationship with the *umbrinus* group, although in the specimens collected there are no females to show the arrangement of mammæ. However, *nelsoni* is evidently a northern form of the group.

Specimens examined.—Total number, 3, as follows:

Chihuahua: Gallego, 1; Parral, 2.

THOMOMYS SHELDONI.[1] SP. NOV.

SHELDON POCKET GOPHER.

(Pl. VI, fig. 12.)

Type from Santa Teresa (6,800 feet altitude), Tepic, Mexico. Adult ♂, No. 90819, U. S. Nat. Mus., Biological Survey collection. Collected August 10, 1897, by E. W. Nelson and E. A. Goldman; collectors' number, 11443.

Distribution.—Transition Zone on the Sierra Madre, Mexico, from northern Chihuahua south to Guanajuato (fig. 9).

Characters.—In size slightly larger than *umbrinus* or *peregrinus*, and more brightly colored than either; ears small; claws slender; skull relatively long, with long nasals and not very protruding incisors; mammæ in 3 pairs.

Color.—Summer pelage: Upperparts light umber, or russet-brown, darker along median line of back, on nose, and about ears; underparts lighter, more tawny; lower half of feet and tip of tail usually white; rarely any white on chin or throat in typical series; white lining of cheek pouches scarcely showing. *Young* duller and darker.

Skull.—Relatively longer than in other members of the group, with longer, narrower nasals and slender rostrum; interorbital region wide and flat; interparietal triangular; nasals slightly emarginate, usually falling short of posterior tips of premaxillæ; anterior base of zygoma nearly straight, in some slightly concave and in others slightly convex; lachrymal adnate to zygoma for over half its length. *Dentition:* Incisors moderately projecting, dark orange, with small but distinct grooves along inner margins.

Measurements.—Type (♂ ad.): Total length, 210; tail vertebræ, 64; hind foot, 29. Average of 4 topotypes (♂ ad.): 200, 62, 28.8. Average of 4 adult females: 191, 61, 28.5. *Skull* (of type): Basal length, 37; nasals, 14.5; zygomatic breadth, 25; mastoid breadth, 19; interorbital breadth, 7; alveolar length of upper molar series, 8.

Remarks.—This is a northern form of the *umbrinus* group, occupying the Transition Zone of the main Sierra Madre of Mexico, and

[1]Named for Charles Sheldon in recognition of his interest in mammals, large and small, and his many contributions of specimens and of notes on their habits.

probably separated by lower country from the range of *peregrinus*, its nearest relative. There is considerable variation in its extension northward to northern Chihuahua but no indication of its intergradation with *intermedius*, which is very similar in general appearance but which with its 4 pairs of mammæ and narrow, slender skull, belongs to the *fulvus* group.

Specimens examined.—Total number, 117, as follows:

Chihuahua: Chuichupa, 1; Colonia Garcia (6,400 feet altitude), 13; near Guadelupe y Calvo (at 7,000 feet), 6; Pacheco, 11; Sierra Madre (65 miles east of Batopilas at 7,000 feet), 5.

Durango: Chacala (3,000 feet), 1, immature; Coyotes, 3; El Salto (8,400 feet), 10; La Boca, 1; Rio Sestin, 1.

Guanajuato: Santa Rosa (8,500 feet), 9.

San Luis Potosi: La Tinaja (6,000 feet), 8; San Luis Potosi, 1.

Sinaloa: Sierra de Choix (50 miles northeast of Choix at 5,000 feet), 3.

Sonora: Alamos (1,200 feet), 5.

Tepic: Santa Teresa (6,800 feet), 10.

Zacatecas: Berriozabal (6,600 feet), 10; Plateado, 4; Sierra Madre (8,500 feet), 5; Valparaiso Mountains (8,700 feet), 10.

THOMOMYS GOLDMANI Merriam.

Goldman Pocket Gopher.

(Pl. VI, fig. 10.)

Thomomys goldmani Merriam, Proc. Biol. Soc. Washington, XIV, 108, July 19, 1901.

Type.—Collected at Mapimi, Durango, Mexico, by E. A. Goldman, December 15, 1893. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Eastern Durango, from Mapimi south to Durango City (fig. 9).

Characters.—Size small, hind foot 27–30 mm.; color bright tawny above, white below; ears minute; skull short and wide, with projecting incisors; mammæ in 3 pairs, inguinal 2–2, pectoral 1–1.

Color.—Upperparts bright tawny, darkening on head and becoming dusky around nose and ears; underparts, tip of tail, and lower part of feet, white.

Skull.—Short and wide with very short nasals and projecting incisors; zygomatic arches slender, nearly parallel, abruptly constricted at posterior base; basioccipital wide and flat; nasals nearly truncate, falling slightly short of posterior tips of premaxillæ; frontals wide, pushing slightly into base of zygomata; lachrymal lying mainly against base of zygoma, as in *umbrinus*.

Measurements.—Type (♂ ad.): Total length, 208; tail vertebræ, 68; hind foot, 30. Female topotype: 190, 60, 27. *Skull* (of type): Basal length, 33; nasals, 12; zygomatic breadth, 22; mastoid breadth, 18; alveolar length of upper molar series, 7.

Remarks.—The specimens from Mapimi exhibit the extreme differentiation of the form. Those from Durango are darker, more nearly

like *peregrinus*, through which *goldmani* evidently connects with the *umbrinus* group.

Specimens examined.—Total number, 9, as follows:

Durango: Durango, 6; Mapimi, 2; San Gabriel, 1.

THOMOMYS PERDITUS Merriam.

Little Gray Pocket Gopher.

(Pl. VI, fig. 9.)

Thomomys perditus Merriam, Proc. Biol. Soc. Washington, XIV. 108, July 19, 1901.

Type.—Collected at Lampazos, Nuevo Leon, Mexico, by Clark P. Streator, January 22, 1891. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Eastern Coahuila and western Nuevo Leon, north to Rock Springs and Castle Mountains, western Texas (fig. 9).

Characters.—Size small, hind foot 25 mm.; color buffy gray or pale tawny; skull short and narrow, with slightly projecting incisors; mammæ in 3 pairs, inguinal 2–2, pectoral 1–1.

Color.—Upperparts dark buffy gray or pale dull tawny, darkest along back; sides brighter; belly and feet pale buffy or creamy white; ear patch, nose, and lips dusky; inside of pouches white.

Skull.—Short, with smooth, rounded braincase and rectangular zygomatic arches; incisors projecting slightly beyond nasals; nasals sharply notched posteriorly and terminating on a plane with short premaxillæ; interparietal normally quadrate, wider than long; anterior base of zygoma strongly convex in outline, unlike most species of the *umbrinus* group.

Measurements.—Type (♂ ad.): Total length, 195; tail vertebræ, 59; hind foot, 26.5. Average of 2 topotypes (♂ ad.): 192, 58, 26.8. Average of 2 females: 180, 54, 24.5. *Skull* (of type): Basal length, 33; nasals, 12; zygomatic breadth, 21; mastoid breadth, 18; alveolar length of upper molar series, 7.

Remarks.—The relationships of this species, as exhibited by the cranial characters, seem not to be very close with any of the surrounding forms, but the number and arrangement of mammæ place it in the *umbrinus* group.

Specimens examined.—Total number, 24, as follows:

Coahuila: Carneros, 5; Jaral, 1; Sierra Encarnacion, 1; Sierra Guadalupe, 4.
Nuevo Leon: Lampazos, 5; Villadama, 2.
Texas: Castle Mountains, 1; Comstock, 2; Devils River, 1; Rock Springs (35 miles east), 1; Samuels, 1.

THOMOMYS ATROVARIUS Allen.

Black-and-Brown Pocket Gopher.

(Pl. VI, fig. 16.)

Thomomys atrovarius Allen, Bul. Am. Mus. Nat. Hist., X, 148, 1898.

Type.—Collected at Tatemales (near Rosario), Sinaloa, Mexico, by P. O. Simons, May 15, 1897. Type specimen in the British Museum.

Distribution.—Coastal Plain of southern Sinaloa and Tepic, from Mazatlan south to Colomo (fig. 9).

Characters.—Size medium, hind foot 30 mm.; pelage thin and harsh; color dark brown or blackish; skull short and wide, with projecting incisors; ears small; claws slender; mammæ in 3 pairs.

Color.—Dark umber, brown, or brownish black; underparts brownish or plumbeous; ears, feet, and tail nearly naked, but lower part of feet and tip of tail usually white when there is hair enough to show color.

Skull.—Slightly heavier and longer than in *umbrinus*, but of the same general characters, with short nasals and less-projecting incisors; base of zygoma slightly indented and the greater part of lachrymal adnate to it; posterior tips of premaxillæ narrowed and extending slightly back of truncate tip of nasals; pterygoids wide apart. *Dentition* slightly heavier than in *umbrinus;* incisors dark orange and very lightly grooved.

Measurements.—Average of 3 females from Rosario: Total length, 196; tail vertebræ, 68; hind foot, 29. Adult male from Mazatlan: 208, 66, 31. *Skull* (of adult male from Mazatlan): Basal length, 36; nasals, 13; zygomatic breadth, 25; mastoid breadth, 20; alveolar length of upper molar series, 8.

Remarks.—Thomomys atrovarius is a well-marked, thin-haired, nearly concolor, tropical species in which the skull characters show close affinities with the *umbrinus* group.

Specimens examined.—Total number, 14, as follows:

Sinaloa: Mazatlan, 2; Plomosas, 2; Rosario, 5; Tatemales, 1.
Tepic: Colomo, 1; Navarete, 2; Pedro Pablo, 1.

Thomomys talpoides Group.

THOMOMYS TALPOIDES TALPOIDES (Richardson).

Saskatchewan Pocket Gopher.

Cricetus talpoides Richardson, Zool. Journ., III, 518, 1828.

Geomys talpoides Richardson, Fauna Boreali-Americana, 204, 1829.

S[accophorus] talpoides Fischer, Synopsis Mammalium, 588 ("388"), 1830. Taken from Richardson.

Geomys borealis Richardson,[1] Sixth Ann. Rept. Brit. Assn. for 1836, V, 150, 156, 1837. Renaming of *talpoides.*

[1] *Geomys borealis* of Richardson has been generally considered a nomen nudum and the name dated from Bachman, two years later, based on a different species. Richardson first used the name (loc. cit., 150) as "Geomys borealis, Rich. nov. sp." On page 156 he states that "*Geomys borealis* inhabits the Plains of the Saskatchewan," and on page 157 he gives good descriptive characters in comparison with several other species. He says "*borealis* and *talpoides* have a very fine groove close to the inner margin of each upper incisor," but evidently failed to detect the much finer grooves on the incisors of *bulbivorus* and *umbrinus* with which he was making the comparison. As Dr. Allen has pointed out (Bul. Am. Mus. Nat. Hist., V, 61, 1893) Richardson was evidently renaming his *talpoides*, of which he here (p. 156) very strangely changes the habitat to Florida. It therefore seems necessary to consider *borealis* a synonym of *talpoides*. Bachman's *borealis* (1839), of which the type is extant and perfectly identifiable, is the same as *clusius* of Coues (1875).

Since writing the foregoing I have received a letter (Mar. 15, 1915) from Mr. Oldfield Thomas, of the British Museum, expressing his opinion that *borealis* of Richardson is not a nomen nudum.

Ascomys borealis Wagner, Suppl. Schreber Säug., III, 391, 1843. Taken from Richardson.
Geomys unisulcatus Gray, List Mamm. Brit. Mus., 149, 1843. Nomen nudum.
Saccophorus borealis Gray, List Mamm. Brit. Mus., 149, 1843. From Richardson.
Ascomys talpoides Wagner, Suppl. Schreber Säug., III, 390, 1843. From Richardson.
Ascomys borealis Wagner, Suppl. Schreber Säug., III, 391, 1843. From Richardson.
Pseudostoma talpoides Audubon & Bachman, Quad. N. Am., III, 43–45, 1854; described and figured from type specimen in collection Zool. Soc., London.
Geomys (Thomomys) talpoides Giebel, Säug., 530, 1855. Compiled from Richardson.
Thomomys talpoides Baird, Mamm. N. Am., 403, 1857.

Type.[1]—Type locality fixed at near Fort Carlton (Carlton House) on the Saskatchewan River, Saskatchewan. Type specimen in British Museum, a stuffed skin and anterior part of skull, which was removed from the skin in 1893.

Distribution.—Plains of Saskatchewan and Alberta; south in Montana to Great Falls and the Big Snowy Mountains (fig. 10).

Characters.—Size medium, between that of *rufescens* and *clusius;* ears prominent and pointed; claws slender; color dull and dark gray; skull not heavily ridged and with slight temporal ridges often converging anteriorly or in the middle; nasals emarginate posteriorly; rostrum slender; mammæ normally in 6 pairs, inguinal 2–2, abdominal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts dull grayish brown with plumbeous nose and blackish ear patch; underparts buffy or soiled whitish gray; chin, and often throat and breast, pure white; feet whitish; tail white tipped or sometimes all white. *Winter pelage:* Upperparts dull dark gray, with little brownish; ear patch black; underparts washed with whitish.

Skull.—Rather short and wide, with anteriorly converging temporal ridges in all but very old individuals; nasals emarginate at posterior tips or rarely truncate; interparietal triangular; audital bullæ full and wide but low, with anterior arm of basioccipital narrow between them. *Dentition* noticeably lighter than in *rufescens;* upper incisors abruptly decurved and distinctly grooved.

Measurements.—Largest male from Borden, Saskatchewan: Total length, 214; tail vertebræ, 60; hind foot, 28. Largest female from same place: 210, 60, 29. Skull (♂ ad. from Borden, Saskatchewan): Basal length, 34.5; nasals, 14; zygomatic breadth, 23; mastoid breadth, 19; interorbital breadth, 6; alveolar length of upper molar series, 7.

[1] The type of *talpoides*, a stuffed skin with part of skull, was procured from Mr. Leadbeater, a London dealer, and was recorded from "Hudson Bay." This evidently meant the country of the Hudson's Bay Co., or western Canada. There are no gophers known nearer the shores of Hudson Bay than on the Saskatchewan, where, as Dr. Allen has pointed out, Richardson refers to them in his original description. Carlton House or Fort Carlton, where Richardson remained for some time, and apparently the highest point he reached on the Saskatchewan River, is near the easternmost point at which these gophers are known to occur along the river. As other species are found farther west on the Saskatchewan, it is necessary to restrict the type locality of *talpoides* still further to the vicinity of Carlton House.

Remarks.—The name *talpoides* has long been applied to the gophers of North Dakota and Manitoba on the supposition that they were the same as those from the Saskatchewan. A series of specimens recently collected at Borden, Saskatchewan, the lowest point at which they could be found along the North Saskatchewan River, and only about 40 miles above the site of old Fort Carlton, prove to be separable from the Dakota animal, which therefore takes the name *rufescens*. The fact that Richardson did not get specimens or even see the gopher which he described is probably due to their absence from the immediate vicinity of Fort Carlton where he records them in an indefinite way. He may have seen their molelike mounds on a short trip up the river or may only have heard of them from trappers and other explorers in that region, possibly from Drummond or Douglas. It, therefore, seems safe to assume that specimens from Borden are typical of *talpoides* of Richardson.

Loring reports gopher hills 20 miles, and Preble 40 miles, north of Edmonton.

Specimens examined.—Total number, 98, as follows:

Alberta: Blindman River, 4; Buffalo Lake, 2; Calgary, 2; Didsbury, 2; Edmonton, 22; Irwin Lake, 1; Red Deer, 23; St. Albert, 2; Waghorn, 1.
Montana: Bearpaw Mountains, 1; Big Snowy Mountains, 2; Blackfoot, 12; Highwood, 3; Zortman, 1.
Saskatchewan: Borden, 16; Indian Head, 4.

THOMOMYS TALPOIDES RUFESCENS Wied.

PRAIRIE POCKET GOPHER; DAKOTA POCKET GOPHER.

(Pl. I; Pl. II, fig. 5; Pl. VII, fig. 1; text figs. 2, 3).

Thomomys rufescens Wied, Nova. Acta. Phys. Med. Acad. Cæs. Leop.-Carol, XIX, pt. 1, 378, 1839.

Type.—Collected at "The Minnetaree Village," now Old Fort Clark, Oliver County, North Dakota (about 6 miles south of Stanton), on the west side of the Missouri River, by Maximilian, Prince of Wiedin. 1833. Type specimen in Am. Mus. Nat. Hist.

Distribution.—Greater part of North Dakota, eastern South Dakota, and southwestern Manitoba (fig. 10).

Characters.—Size large; feet large and claws stout; ears prominent and pointed, not a mere thickened rim as in some western species; color dull and dark gray; skull heavy, with parallel temporal ridges and wide basioccipital; rostrum slender; incisors abruptly decurved, distinctly grooved; mammæ in 6 pairs, inguinal 2–2, abdominal 2–2, pectoral 2–2.

Color.—Thin summer pelage (July and August): Upperparts dull brownish gray; ear and surrounding fur black; underparts buffy gray with more or less pure white on chin, throat, and breast; feet whitish; tail whitish or gray at base. *Early winter pelage* (October): Dark buffy gray above, almost as dark as in summer. *Full winter pelage*

(November to May): Bright buffy gray above, fading to paler buffy in spring. *Young*: Upperparts duller, more plumbeous, fading to buffy when half grown, changing to dark fall pelage in October. [See section on molt (p. 18); also five molts shown on one animal in fig. 3, No. 1.]

Skull.—Long and straight, with shallow rostrum and strongly developed and approximately parallel temporal ridges; nasals long and truncate or rounded at posterior tip; bullæ long and rather narrow (becoming very narrow in specimens from the eastern part of the range), basioccipital with wide, heavy shaft between bullæ; auditory meatus slender. *Dentition:* Molars heavy; incisors decurved at right angle to axis of skull.

Measurements.—Adult male from near Fort Clark, N. Dak.: Total length, 240; tail vertebræ, 70; hind foot, 31. Adult female from same locality: 230, 70, 31. *Skull* (of adult male from near Fort Clark): Basal length, 40; nasals, 15.5; zygomatic breadth, 25; mastoid breadth, 22; interorbital breadth, 7; alveolar length of upper molar series, 8.

Remarks.—There is now ample material from the type locality and its general region to show the characters of *rufescens*, which proves to be the large, dark-colored gopher occupying the greater part of North Dakota, eastern South Dakota, and southwestern Manitoba. Specimens from the type region in early winter fur (November or December) are still needed to complete our knowledge of seasonal variation in pelage, but this pelage will probably be found to agree, as do most other characters, with specimens from the eastern part of the State.

The type, a mounted specimen with skull inside, much faded but otherwise in good condition, is in the American Museum of Natural History. It has been removed from the base, and the old label, once tacked on the base, is now attached to the foot. It bears the legend "*Thomomys rufescens* Wied. Machtohpka indigen" and also "Mas Missouri," not very legible. It hardly seemed necessary to remove the skull from so old and fragile a specimen, as there are good topotypes, and the general size and large claws are good characters. The hind foot measures 30 mm., dry. It is marked "♂" on the museum label, which also is attached to the foot.

Specimens examined.—Total number, 159, as follows:

Manitoba: Aweme, 4; Carberry, 11; Selkirk Settlement, 1.

North Dakota: Bismarck, 4; Bottineau, 1; Braddock, 1; Cannonball River, 6; Devils Lake, 1; Dickinson, 2; Fish Lake (in Turtle Mountains), 8; Fort Clark, 5; Fort Rice, 1; Glen Ullin, 1; Grafton, 3; Hensler, 6; Jamestown, 6; Larimore, 7; Mandan, 10; Minnewaukan, 3; Minot, 1; Oakdale, 8; Pembina, 25; Portland, 1; Sherbrooke, 6; Souris River, 2; Steel 1; Streeter, 2; Stump Lake, 1; Valley City, 9; Wade, 2; Walhalla, 2; Washburn, 3.

South Dakota: Aberdeen, 2; Armour, 3; Fort Randall, 2; Fort Sisseton, 3; Highmore, 1; Pierre, 3; White Lake, 1.

THOMOMYS TALPOIDES CLUSIUS Coues.

Coues Pocket Gopher.

(Pl. II, fig. 6; Pl. VII, fig. 5; text fig. 3.)

Geomys borealis Bachman,[1] Journ. Acad. Nat. Sci. Phila. VIII, pt. 1, 103, 1839. Type locality said to be the "Columbia River," probably in Colorado near the southeast corner of Wyoming. (Not of Richardson.)

Pseudostoma borealis Audubon & Bachman, Quad. N. Am., III, 198, pl. 142, 1853. (Not *Geomys borealis* of Richardson.)

Thomomys clusius Coues, Proc. Acad. Nat. Sci. Philadelphia, 1875, 138, June 15, 1875.

Type.—Collected at Bridgers Pass, Carbon County, Wyoming, (18 miles southwest of Rawlins), by Dr. W. A. Hammond, July 28, 1857. Type specimen in U. S. Nat. Mus.

Distribution.—Central and southeastern Wyoming (north to Parkman, Sheridan County), and eastern Colorado south to Colorado Springs (fig. 10).

Characters.—Considerably smaller than *talpoides*, with slenderer claws; color slightly more rufescent; skull with the same shallow rostrum, but differing in having smaller size, large rounded bullæ, and lighter dentition; mammæ in 6 or 7 pairs, inguinal 2–2, abdominal 2–2, pectoral 2–2, or sometimes 3–3; embryos 5 to 7.

Color.—Summer pelage: Upperparts light buffy- or hazel-gray, brightest on crown, paler along sides; cheeks clear gray; ear patch blackish; underparts whitish or buffy; chin sometimes white; feet and tip of tail whitish. *Autumn pelage* (September): Upperparts duller and darker; crown and back dull hazel darkened with black-tipped hairs that apparently fade or wear off and leave a grayish or buffy brown in winter; black ear patch conspicuous. *Young* paler, more buffy gray.

Skull.—Light and slender, not angular or heavily ridged; temporal ridges parallel in fully adult specimens; audital bullæ much larger

[1] Bachman's description of *Geomys borealis*, which he credits to Richardson, was based mainly on a specimen collected by Townsend, of which he says, "Mr. Townsend's specimens were procured on the Columbia River." The very full description of *borealis*, including measurements, agrees perfectly with one (No. 146) of the three specimens brought back by Townsend and now before me through the kindness of Dr. Witmer Stone, of the Academy of Natural Sciences of Philadelphia. I have had the skulls removed from these three mounted specimens, and for the first time it is possible to identify them. The old labels which were formerly tacked on the stands are now attached to these specimens, and Dr. Stone thinks they are in the handwriting of Le Conte, who published on them in 1852, 18 years after they were collected. (Le Conte also described a *Geomys bursarius* as *Geomys oregonensis* from a specimen labeled "Columbia River, J. K. Townsend.") It is probable that the specimens came into the collection without labels, and were supposed to have come from the Columbia River, but none of the three of *Thomomys* were collected anywhere near the Columbia. No. 147 is Bachman's type of *townsendi* and No. 144 is an adult specimen of *pygmæus* which Bachman considered a young of *borealis*. Bachman's type of *borealis* proves to be identical with *clusius* of Coues. Townsend in his Narrative (p. 59) mentions a pocket gopher which he picked up near Scott's Bluff, Nebr., at a point near the southeastern corner of what is now Wyoming. As this specimen was preserved and is the only specimen mentioned in the narrative, it may well be the type of Bachman's *borealis*. As Richardson two years earlier applied the name *borealis* to another species (*talpoides*), Bachman's name has no standing in this connection. The fact that Richardson had identified this specimen as his *borealis*, and on it had drawn up a full description which was used by Bachman, does not make available the name which was already a synonym of *talpoides*.

and more rounded than in *talpoides;* anterior arm of basioccipital very narrow; nasals slenderer, especially at posterior tips, which are variously rounded, truncate, or slightly emarginate in the topotype series; interparietal small and triangular. *Dentition* conspicuously lighter than in *talpoides.*

Measurements.—Topotype (♂ ad.): Total length, 205; tail vertebræ, 66; hind foot, 28.5. Average of 7 female topotypes: 204, 60, 27. *Skull* (topotype, ♂ ad.):[1] Basal length, 33.4; nasals, 13; zygomatic breadth, 22; mastoid breadth, 19.5; interorbital breadth, 11.5: alveolar length of upper molar series, 7.

Remarks.—In general appearance *clusius* is nearer *talpoides* than is the larger and paler *bullatus*, which separates their ranges and evidently grades into one on the north and the other on the south. It is not improbable, however, that *clusius* and *talpoides* meet in a narrow Transition Zone strip along the eastern base of the Rocky Mountains above the Upper Sonoran limits of *bullatus.* At the type locality and over most of its range *clusius* is found in Transition Zone sage-brush country.

Specimens examined.—Total number, 106, as follows:

Colorado: Avalo, 5; Boulder, 1; Canadian Creek (North Park), 6; Colorado Springs, 7; Estes Park, 1; Flagler, 7; Gold Hill, 1; Limon, 1; Pawnee Buttes, 1; Siebert (8 miles south), 1.

Wyoming: Bear Creek (3 miles southwest of Laramie Peak, at 7,500 feet altitude), 1; Beaver, 1; Bridgers Pass, 14; Casper (40 miles southwest), 4; Cheyenne, 7; Dayton, 1; Douglas, 2; Ferris Mountains (7,800 to 9,400 feet), 4; Fetterman, 1; Fort Russell, 1; Fort Steele, 3; Green Mountains (8,000 feet), 2; Islay, 2; Laramie Mountains (east of Laramie, at 8,500 and 9,000 feet), 3; Little Bear Creek (20 miles southeast of Chugwater), 1; Miners Delight, 1; Myersville, 2; Myersville (22 miles southeast), 1; Pass (now Parkman), 2; Pine Bluffs, 2; Rattlesnake Mountains (north base), 3; Rawhide Butte (5,400 feet), 1; Red Bank, 1; Rock Creek, 1; Sherman, 2; Shirley Mountains (7,600 to 8,800 feet), 4; Springhill (12 miles north of Laramie Peak), 2; Sun, 3; Wheatland (15 miles southwest, at 5,200 feet), 1; Woods, 2.

THOMOMYS TALPOIDES BULLATUS Bailey.

SAGE POCKET GOPHER.

(Pl. VII, fig. 2.)

Thomomys talpoides bullatus Bailey, Proc. Biol. Soc. Washington, XXVII, 115, July 10, 1914.

Type.—Collected at Powderville, Custer County, Montana, by Dr. A. K. Fisher, July 21, 1893. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Plains of eastern Montana, northeastern Wyoming, and western South Dakota; north to Medicine Hat, Alberta (fig. 10).

Characters.—Size of *talpoides*, but with larger audital bullæ, lighter dentition, and brighter colors; mammæ usually in 6 pairs; young, 5 to 7.

[1] No. 25534, U. S. Nat. Mus.

Color.—Summer pelage: Practically the same as in *clusius*, with less gray on cheeks; upperparts light buffy- or hazel-gray, brightest on crown; ear patch blackish; underparts buffy, sometimes with white on chin; feet and tail whitish. *Winter pelage* (November specimen, from Fort Custer): Upperparts much paler, light buffy gray; underparts creamy white.

Skull.—Size and general form nearly as in *talpoides*, but less ridged and with smaller molars, much larger and more rounded bullæ, and narrower anterior shaft of basioccipital.

Measurements.—Type (♂ ad.): Total length, 238; tail vertebræ, 72; hind foot, 30. Male topotype: 242, 76, 30; female topotype: 225, 78, 29. *Skull* (of type): Basal length, 37.6; nasals, 15.5; zygomatic breadth, 24; mastoid breadth, 20.3; interorbital breadth, 6.5; alveolar length of upper molar series, 8.

Remarks.—This is a pale Upper Sonoran form, not entirely intermediate between *talpoides* and *clusius*, both of which are Transition Zone forms (one of the humid grass-prairies, the other of arid sagebrush). To some extent *bullatus* combines the characters of both, but is not quite intermediate and has a well-defined range. The beautiful series of specimens from Medicine Hat, Alberta, mainly immature females, are in the light gray, early winter coat. They are provisionally placed with this form until better characters can be observed from skulls of adult males and from summer skins.

Specimens examined.—Total number, 82, as follows:

Alberta: Medicine Hat, 10 (not typical).

Montana: Alzada, 1; Cedar Creek (15 miles north of Terry), 3; Darnalls (on south bank Missouri River south of Glasgow), 1; Fort Assiniboine, 4; Fort Custer, 6; Fort Thorne, 1; Johnson Lake, 2; Piney Buttes, 2; Powderville, 4; Red Lodge, 1; Terry, 1.

North Dakota: Buford, 4; Yellowstone River (mouth), 1.

South Dakota: Buffalo Gap, 3; Corral Draw (Pine Ridge Indian Reservation), 4; Crow Buttes (Harding County), 1; Elk Mountain, 10; Fort Meade, 1; Rapid City, 2; Smithville, 2.

Wyoming: Clearmont, 1; Devils Tower, 1; Ishawooa Creek, 4; Moorcroft, 3; Newcastle, 5; Powder River crossing, 2; Sage Creek (west of Fort Washakie), 1; Wind River (north of Washakie), 1.

THOMOMYS TALPOIDES NEBULOSUS Bailey.

Black Hills Pocket Gopher.

(Pl. VII, fig. 3.)

Thomomys talpoides nebulosus Bailey, Proc. Biol. Soc. Washington, XXVII, 116, July 10, 1914.

Type.—Collected in Sand Creek Canyon, Black Hills, Wyoming (at Jack Boyden's ranch, 5 miles above mouth of Canyon, at 3,750 feet altitude), by Vernon Bailey, August 25, 1913. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Black Hills, S. Dak., and Bear Lodge Mountains, Wyo. (fig. 10).

Characters.—Size of *talpoides;* color more brownish gray; skull slender, lightly ridged; dentition light; bullæ well rounded; not very different externally from *fossor*, but mammæ in 6 pairs, inguinal 2–2, abdominal 2–2, pectoral 2–2.

Color.—Summer pelage (July and August): Upperparts dull grayish brown; nose plumbeous or dusky; ear patch blackish; underparts buffy, generally with white on chin and sometimes on breast; feet and tail whitish gray or buffy. *Winter pelage* (held over in April specimens from Redfern, S. Dak.): Dark buffy gray, darker than in similar coat of *talpoides*, not so rufescent as in *fossor;* underparts light buff. *Young* (half-grown July specimen from Custer, S. Dak.): Dull and dark, as in *talpoides.*

Skull.—Larger and more heavily ridged than in *talpoides* but less heavily ridged than in *rufescens;* temporal ridges parallel in adults, and interparietal triangular; audital bullæ full and well rounded but not so large as in *bullatus;* basioccipital slender. *Dentition* conspicuously light. Compared with *fossor*, the skull is larger, relatively wider, and more robust.

Measurements.—Type: Total length, 230; tail vertebræ, 66; hind foot, approximately 32 (27 without toenails). Average of 4 female topotypes: 226, 65, 31.5. *Skull* (of type): Basal length, 37.7; nasals, 14.3; zygomatic breadth, 24.3; mastoid breadth, 20; interorbital breadth, 6.5; alveolar length of upper molar series, 7.7.

Remarks.—This is a well-marked form of *talpoides*, occupying the higher parts of the Black Hills and Bear Lodge Mountains, and coming down in wooded canyons to the base of both ranges in the Canadian and Transition Zones. In the Bear Lodge Mountains it is less strongly differentiated from *talpoides* and shows a tendency toward *bullatus*, but can best be placed with the Black Hills form.

Specimens examined.—Total number, 27, as follows:

South Dakota: Beaver Creek, 1; Custer, 4; Redfern, 4; Spring Creek, 1; Tigerville, 2.

Wyoming: Bear Lodge Mountains (at 6,000 and 6,200 feet altitude), 6; Rattlesnake Creek (head, at 6,000 feet in the Black Hills), 2; Sand Creek Canyon, 5; Sundance (in canyon at base of Bear Lodge Mountains), 2.

THOMOMYS TALPOIDES CARYI Bailey.

BIGHORN POCKET GOPHER.

(Pl. VII, fig. 6.)

Thomomys talpoides caryi Bailey, Proc. Biol. Soc. Washington, XXVII, p. 115, July 10, 1914.

Type.—Collected at head of Trapper Creek, at 9,500 feet altitude, in the Bighorn Mountains, Wyoming, by Merritt Cary, July 10, 1910. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Canadian Zone on Bighorn Mountains, Wyo. (fig. 10).

Characters.—Size about the same as *clusius* or slightly smaller; color darker, more rufescent, without gray cheeks and sides; skull with smaller bullæ and wider interparietal; mammæ in 6 pairs.

Color.—Summer pelage (September): Upperparts warm grayish brown, with plumbeous nose and black ear patch; underparts rich buffy with white on chin and sometimes on breast; feet soiled whitish; tail gray or buffy with whitish tip. *Winter pelage* (on rump of type, June 10): Dark buffy gray, underparts creamy.

Skull.—General form similar to that of *clusius* but with shorter, wider interparietal, slightly smaller bullæ, and generally wider and more emarginate nasals.

Measurements.—Type (♀ young ad.): Total length, 196; tail vertebræ, 54; hind foot, 26. Topotype (♀ more fully ad.): 203, 58, 28. *Skull* (of type): Basal length, 32.5; nasals, 12; zygomatic breadth, 20.5; mastoid breadth, 18; interorbital breadth, 6; alveolar length of upper molar series, 6.2.

Remarks.—This form is poorly represented, but shows characters that exclude it from any of the neighboring forms. Externally it most closely resembles the Black Hills gopher, but in cranial characters stands nearest to *clusius*, of which it may be considered a dark-colored mountain race. A good series of specimens including adult males from the high central area of the Bighorn Mountains will doubtless show more pronounced characters. The details of the distribution of the form remain to be worked out. The specimens examined are all females and from the Canadian Zone.

Specimens examined.—Total number, 4, as follows:

Wyoming: Bighorn Mountains (9,000 and 9,500 feet altitude, in central part), 2; Bighorn Mountains (8,400 and 9,000 feet, in southern part), 2.

THOMOMYS TALPOIDES PRYORI Bailey.

Pryor Mountain Pocket Gopher.

(Pl. VII, fig. 7.)

Thomomys pryori Bailey, Proc. Biol. Soc. Washington, XXVII, 116, July 10, 1914.

Type.—Collected on Pryor Mountains, Montana, at head of Sage Creek (6,000 feet altitude), by Vernon Bailey, July 16, 1894. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Pryor Mountains, Mont., east to the Bighorn River, near Fort Custer (fig. 10).

Characters.—Size of *clusius*, but darker colored and with shorter nasals and more projecting incisors; mammæ in 6 pairs, inguinal 2–2, abdominal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts dull walnut-brown, about as in *fossor;* nose plumbeous; cheeks dark gray; ear patch black;

underparts dark buff with no trace of white in topotype series; feet and tail soiled whitish or buffy. *Winter pelage* (as shown in long fur retained on rump of type and one topotype): More grayish brown.

Skull.—Low and wide, with very short and posteriorly pointed nasals; temporal ridges parallel; interparietal triangular; audital bullæ rather small; basioccipital wide between bullæ; interpterygoid fossa narrow and sharp. *Dentition* light; upper incisors strongly projecting; inner grooves not so distinct as in *talpoides.*

Measurements.—Type (♂ ad.): Total length, 210; tail vertebræ, 60; hind foot, 29. Average of 2 female topotypes: 201, 53, 28.5. *Skull* (of type): Basal length, 34; nasals, 12.5; zygomatic breadth, 22; mastoid breadth, 18.5; interorbital breadth, 5.7; alveolar length of upper molar series, 7.

Remarks.—This seems to be a very local form of the higher slopes of the Pryor Mountains, and undoubtedly grades into some of the other forms below. It seems to be distinct from *caryi,* the gopher on the Bighorn Range, from which it is separated by the deep canyon of the Bighorn River, and also from *bullatus,* from which it is separated at Fort Custer by the river. The shallow, slender rostrum and arrangement of mammæ place it in the *talpoides* group, but the peculiar nasals and projecting incisors are not found in any of the other forms.

Specimens examined.—Total number, 7, as follows:

Montana: Bighorn River (west side, near Fort Custer), 2; Pryor Mountains (cold slopes, edge of Canadian Zone), 5.

THOMOMYS TALPOIDES AGRESTIS Merriam.

San Luis Pocket Gopher.

(Pl. VII, fig. 4.)

Thomomys talpoides agrestis Merriam, Proc. Biol. Soc. Washington, XXI, 144, June 9, 1908.

Type.—Collected at Medano Ranch (15 miles northeast of Mosca), San Luis Valley, Colorado, by Merritt Cary, October 29, 1907. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—San Luis Valley, Colo. (fig. 8).

Characters.—Decidedly larger and paler than typical *clusius;* skull heavier and more conspicuously ridged; more nearly resembling *bullatus,* but with relatively narrower skull, and larger, more pointed nasals.

Color.—Summer pelage: Upperparts buffy or brownish gray, richest along median line of back; ear patch blackish; nose gray; underparts buffy; chin white in two specimens; a white spot on breast in one; feet and tail whitish or buffy gray. *Winter pelage:* Upperparts lighter, more grayish; underparts whitish or creamy.

Skull.—Long and narrow, with uniformly arched outline; temporal ridges prominent and parallel in old age; nasals long and narrow, and pointed at posterior tip, with a slight expansion back of middle; interparietal triangular; auditory meatus slender; bullæ medium, not so full and rounded as in *bullatus*. *Dentition* medium; incisors bent at right angles to axis of skull.

Measurements.—Type (♀ ad.): Total length, 220; tail vertebræ, 57; hind foot, 30. Topotype (♂ not fully ad.): 205, 50, 30. *Skull* (of type): Basal length, 38; nasals, 15; zygomatic breadth, 23.5; mastoid breadth, 19.7; interorbital breadth, 6.5; alveolar length of upper molar series, 8.

Remarks.—This is a well-marked local form of the *talpoides* group occupying the great arid San Luis Valley, in open sage brush of the Transition Zone. At present it may be isolated from other forms of the group except *fossor*, by which it is surrounded in the timbered mountains and from which it may have been derived. More probably, however, it is a more recent derivative of *clusius* which has entered the valley through one of the passes.

Specimens examined.—Total number, 18, as follows:

Colorado: Blanco, 1; Creston, 1; Fort Garland, 2; Medano Ranch, 5; Saguache (12 miles northwest), 1; San Acacia, 8.

THOMOMYS COLUMBIANUS Bailey.

Columbia Pocket Gopher.

(Pl. VII, fig. 12.)

Thomomys fuscus columbianus Bailey, Proc. Biol. Soc. Washington, XXVII, 117, July 10, 1914.

Type.—Collected at Touchet, Walla Walla County, Washington, by Clark P. Streator, September 10, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Plains of southeastern Washington and northern Oregon (fig. 5).

Characters.—Size slightly smaller than *talpoides*, slightly larger than *quadratus*, colors paler than either, about as in *fisheri;* skull heavier than in *quadratus;* claws moderately stout; mammæ in 6 pairs, inguinal 2–2, abdominal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts light wood brown or buffy gray; sides and belly pale buffy gray; ear and postauricular patch black; nose slaty; tail gray with white tip; feet whitish. *Winter pelage* slightly grayer. *Young* very gray.

Skull.—Smaller than that of *talpoides*, with shorter, wider nasals; larger and longer than that of *quadratus*, rather heavy and angular; lateral ridges well developed in adults, approximately parallel; bullæ

large and rounded, widening base of skull and narrowing shaft of basioccipital; interparietal more or less triangular.

Measurements.—Type (♂ ad.): Total length, 209; tail vertebræ, 60; hind foot, 28. Topotype (♀ ad.): 208, 68, 27. *Skull* (of type): Basal length, 34; nasals, 13; zygomatic breadth, 22.7; mastoid breadth, 18.7; alveolar length of upper molar series, 8.

Remarks.—The relationships of this form are doubtful. In many respects it resembles the *talpoides* group, especially in arrangement of mammæ and in general skull characters. In small ears and rather square-built skull it seems close to *quadratus*, and there is some question whether along the borders of its range it does not interbreed with both *quadratus* and *fuscus*. Two young females from Asotin, Wash., are probably typical of *columbianus*, but are too young to afford reliable characters. An old male from Willows Junction, Oreg., is very small, but is provisionally referred to *columbianus*.

Specimens examined.—Total number, 37, as follows:

Oregon: Pendleton, 4; Umatilla, 9; Willows Junction, 1.

Washington: Asotin, 2; Baird, 9; Fort Walla Walla, 3; Prescott, 4; Touchet, 4; Wallula, 1.

THOMOMYS OCIUS Merriam.

Green River Pocket Gopher.

(Pl. II, fig. 12; Pl. VII, fig. 9.)

Thomomys clusius ocius Merriam, Proc. Biol. Soc. Washington, XIV, 114, July 19, 1901.

Type.—Collected near Old Fort Bridger, Wyoming (exact locality, dry sagebrush mesas at Harvey's Ranch, on Smiths Fork, 6 miles southwest of Fort Bridger), by Vernon Bailey, May 24, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Green River Basin of southwestern Wyoming, northwestern Colorado, and northeastern Utah (fig. 10).

Characters.—Size small; color very pale; skull slender, with very large and rounded audital bullæ and sharply incurved upper incisors; ears very small but pointed; mammæ normally in 7 pairs, inguinal 2–2, abdominal 2–2, pectoral 3–3.

Color.—Summer pelage: Upperparts light buffy gray, more strongly buffy or tinged with brownish on crown and back; sides clear gray; cheeks darker gray; ear patch blackish but small; underparts, feet, and tail soiled whitish or creamy. *Winter pelage:* Upperparts lighter buffy gray; nose and cheeks clearer gray; underparts whitish or creamy.

Skull.—Rather narrow, with slightly arched dorsal outline; interparietal short and wide; temporal ridges slightly converging anteriorly; posterior tips of nasals rounded; audital bullæ very large and

smoothly rounded, with anterior arm of basioccipital slender and narrow between them. *Dentition:* Upper incisors sharply incurved so that the cranium can be readily suspended by them, and lower incisors also curved very abruptly upward.

Measurements.—Type (a large old male): Total length, 204; tail vertebræ, 60; hind foot, 26. Topotype (♂ ad.): 188, 51, 24. Average of 6 topotypes (♀ ad.): 194, 58, 24.6. *Ear:* From crown, measured in flesh, 5. *Skull* (of type): Basal length, 33; nasals, 12; zygomatic breadth, 20; mastoid breadth, 17; interorbital breadth, 5.5; alveolar length of upper molar series, 7.

Remarks.—This is a little, pale, desert species of the Green River Basin, mainly in the Upper Sonoran Zone. It occupies the dry, sagebrush mesas, while *bridgeri* occupies the fertile valleys close by. Fort Bridger seems to be the extreme upper limit of *ocius*, and here its range meets that of the much larger *bridgeri* and almost or quite meets that of the smaller, darker-colored *pygmæus*. On the east it meets the range of *clusius*, but I find no signs of intergradation, and the skull characters are so strongly marked that it seems best to treat *ocius* as a full species. Its nearest relatives are *idahoensis* of southern Idaho, and more remotely the little *pygmæus*, along its western border in the Transition Zone. These three forms are the only members of the genus in which the crania can be readily suspended by hooking the upper incisors over a wire or string. The ears of *ocius* are very small, measuring uniformly 5 mm. from posterior base to tip in fresh specimens, while in *bridgeri* from the same locality they measure 8 mm. The females have normally 14 mammæ and contained 7 fetuses, contrasted with 10 mammæ and 5 fetuses in *bridgeri*, collected at the same time and place.

Specimens examined.—Total number, 38, as follows:

Colorado: Douglas Spring, 1; Ladore, 2; Lay, 1; Lily, 2; Rangely, 2; Snake River (20 miles west of Baggs), 2.

Utah: Uncompahgre Indian Reservation, 2.

Wyoming: Bitter Creek, 2; Eden, 1; Fontenelle, 1; Fort Bridger, 9; Green River (junction of New Fork), 3; Henrys Fork, 1; Maxon (5 miles southwest), 8; Opal, 1.

THOMOMYS IDAHOENSIS Merriam.

Idaho Pocket Gopher.

(Pl. II, fig. 7; Pl. VII, fig. 10.)

Thomomys idahoensis Merriam, Proc. Biol. Soc. Washington, XIV, 114, July 19, 1901.

Type.—Collected at Birch Creek (10 miles south of Nicholia, at about 6,400 feet altitude), Fremont County, Idaho, by Clark P. Streator, August 8, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Snake River Plains, southeastern Idaho (fig. 10).

Characters.—Size very small; color pale yellowish gray; ears small; skull light and smooth, with very large and globose bullæ and incurved upper incisors; mammæ in 6 pairs, inguinal 2–2, abdominal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts pale dull olive-buff or buffy gray; ear with only a trace of dusky patch; nose yellowish; underparts pale buff or soiled whitish, occasionally with white chin; feet and tail very hairy, pale buffy or whitish. *Young*, more ashy gray. *Winter pelage* unknown. The summer pelage is decidedly paler than the corresponding pelage of *ocius*, hence the winter pelage is probably lighter colored than in any other northern species of the genus.

Skull.—Of much the same general form as in *ocius*, but conspicuously smaller and smoother with smaller, more oval interparietal; nasals minutely notched at posterior tip and ending approximately even with premaxillæ; audital bullæ very large and globose, sometimes actually meeting over narrow shaft of basioccipital. While the external ear is very small, the auditory meatus and audital bullæ are unusually developed, the bullæ being relatively the largest of any species of the genus.

Measurements.—Type (♂ ad.): Total length, 179; tail vertebræ, 47; hind foot, 23. Average of 10 male topotypes: 179, 50, 22.5. Average of 9 female topotypes: 166, 49, 22.4. *Ear*, from base, measured in flesh, 4.5. *Skull* (of type): Basal length, 29.5; nasals, 11.5; zygomatic breadth, 18; mastoid breadth, 16; interorbital breadth, 4.7; alveolar length of upper molar series, 5.5.

Remarks.—The type locality is at the extreme upper edge of the Upper Sonoran Zone and the upper limit of the range of the species. This gopher is a small, pale, desert species of the Snake River Plains. There is no indication of its intergradation with any of the surrounding forms, and its nearest relative is *ocius* of the upper Green River Basin in Wyoming. The boundary of its range remains to be worked out, and winter or early spring specimens are greatly needed to show the winter pelage.

Specimens examined.—Total number, 42, as follows:

Idaho: Big Butte, 2; Big Lost River (near Sink), 3; Birch Creek (10 miles south of Nicholia, 6,400 feet altitude), 21; Blackfoot, 11; Dubois, 1; Idaho Falls, 1; Sink of Birch Creek (5,100 feet), 3.

THOMOMYS PYGMÆUS Merriam.

Pygmy Pocket Gopher.

(Pl. VII, fig. 11.)

Thomomys pygmæus Merriam, Proc. Biol. Soc. Washington, XIV, 115, July 19, 1901.

Type.—Collected at Montpelier Creek (exact locality about 10 miles northeast of Montpelier, at 6,600 feet altitude, in open sagebrush of

Transition Zone), Bear County, Idaho, by Vernon Bailey, July 29, 1893. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Southwestern Wyoming and southeastern Idaho (Transition Zone) (fig. 10).

Characters.—Size smallest of the genus; color rich hazel-brown; skull very slender and delicate with not very large audital bullæ; upper incisors incurved, distinctly grooved; ears small; mammæ in 6 pairs, inguinal 2–2, abdominal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts rich hazel-brown, very uniformly distributed; dusky earpatches inconspicuous; nose plumbeous; underparts dull ochraceous, rarely with any white markings; tail usually entirely buffy gray; feet whitish or buffy. *Winter pelage:* Paler, more buffy brown. *Young:* Duller, more grayish and with lighter-colored belly.

Skull.—Very small, slender, and thin, the slight trace of temporal ridges converging anteriorly; interparietal wide and oval; nasals notched or emarginate at posterior tip; bullæ rather small; auditory meatus slender; interpterygoid fossa narrow and acute angled; basioccipital narrow. *Dentition* very light; upper incisors incurved to a slightly less degree than in *ocius* and *idahoensis*.

Measurements.—Type (♂ ad.): Total length, 177; tail vertebræ, 46; hind foot, 22. Topotype (♂ ad.): 165, 40, 20. Specimen from Bear River (♀ ad.): 168, 50, 23. *Skull* (of type): Basal length, 28.4; nasals, 10.4; zygomatic breath, 16.5; mastoid breadth, 14.5; interorbital breadth, 5; alveolar length of upper molar series, 6.

Remarks.—This, the smallest of all known pocket gophers, seems not to be closely related to any of the neighboring forms nor to intergrade with them. It has some of the skull characters of *fuscus*, but seems to be more nearly related to *idahoensis* and *ocius*, from which, however, it is quite distinct. It occurs in the same localities but apparently not on the same ground with the much larger *bridgeri* and *uinta*, occupying the Transition Zone sagebrush ridges and mesas, while they are restricted to the mellow soil and more fertile bottoms of the stream valleys. A specimen in the Academy of Natural Sciences of Philadelphia (No. 144), collected by J. K. Townsend in 1834, probably came from the Bear River region, but was later labeled "Columbia River."

Specimens examined.—Total number, 23, as follows:

Idaho: Montpelier Creek (12 miles northeast of Montpelier at 6,700 feet altitude), 2.

Wyoming: Bear River and Bear River Divide (14 miles north of Evanston at 6,600–7,500 feet), 12; Big Piney (6,400 feet), 1; Big Sandy, 1; Fossil (6,600 feet), 1; Lone Tree (5 miles west, on Henry Fork, 7,400 feet), 2; Merna (on Horse Creek, 7,800–8,000 feet), 3; Surveyors Park (12 miles northeast of Pinedale, 8,000 feet), 1.

Thomomys fossor Group.

THOMOMYS FOSSOR Allen.

Colorado Pocket Gopher.

(Pl. II, fig. 8; Pl. VII, fig. 13; text fig. 4.)

Thomomys fossor Allen, Bul. Am. Mus. Nat. Hist. V, 51, April 28, 1893.

Type.—Collected at Florida, La Plata County, Colorado, altitude 7,200 feet, by Charles P. Rowley, June 25, 1892. Type specimen in Am. Mus. Nat. Hist.

Distribution.—Mountains of western Colorado, extreme southern Wyoming, northern New Mexico, eastern and southern Utah, and northwestern Arizona (fig. 8).

Characters.—Size medium, hind foot averaging about 29 mm.; color dull and dark brown; ears large; skull long, low, and narrow, with rostrum especially slender in profile, as in the *talpoides* group; mammæ in 5 pairs, inguinal 2–2, pectoral 3–3.

Color.—Summer pelage: Upperparts dull dark brown with sometimes a rich chestnut tone; ear and postauricular patch black; nose and face dusky; underparts buffy or ochraceous; part of feet and tip of tail usually whitish; chin usually, and spot on breast sometimes, white. *Winter pelage:* Duller, more grayish or drab. *Young:* In summer paler and more buffy than adults.

Skull.—Long and slender, with long rostrum, and anteriorally converging temporal ridges; nasals narrow, with generally rounded posterior tips; interparietal triangular; bullæ large and full, basioccipital narrowed between them. *Dentition* very light.

Measurements.—Average of 4 female topotypes: Total length, 221; tail vertebræ, 63; hind foot, 29. A large male measures 220, 68, 32. *Skull* (of type, ♂ ad.): Basal length, 37; nasals, 15; zygomatic breadth, 22; mastoid breadth, 20; alveolar length of upper molar series, 7.5. Skull of adult male from Lake City, Colo.:[1] 34, 13.5, 21, 18.7, 7.

Remarks.—This is a wide-ranging boreal species with long, soft fur, which even in midsummer does not become so short and harsh as in low-country species. At high altitudes the long coat seems not to be entirely lost during the brief summer.

As might be expected there is some slight variation in specimens from different mountain ranges, some of which are entirely isolated by low country, but nowhere is there enough variation to warrant further subdivision. In such a variable group it is a great satisfaction to find an occasional species that holds its distinctive characters over a wide area.

Specimens examined.—Total number, 183, as follows:

Arizona: Bright Angel Spring (Kaibab Plateau), 3; DeMotte Park (Kaibab Plateau), 3.

[1] No. 48190, U. S. Nat. Mus.

Colorado: Arapahoe Pass (Rabbit Ear Mountains), 5; Black Hawk, 2; Baxter Pass (Book Plateau), 2; Boulder (5 miles west, at 5,600 feet altitude), 7; Cascade, 1; Cochetope Pass (3 miles east), 5; Colorado City, 1; Colorado Springs (2½ miles north, at 6,000 feet), 1; Colorado Springs (east of Palmer Park), 1; Como, 1; Coulter, 3; Crested Butte, 4; Culebra Canyon (Costilla County), 1; Elk Head Mountains, 2; Elkhorn, 1; Estes Park, 6; Florida, 5; Golden, 2; Hahns Peak, 2; Hayden, 1; Lake City, 2; Longs Peak, 3; Meeker, 3; Montgomery, 3; Nederland, 4; Pagosa Springs, 3; Pagosa Peak, 1; Pearl, 1; Saguache (23 miles northwest), 1; Sapinero, 2; Silverton, 2; Uncompahgre Plateau, 2; Teller County Divide, 1; White River Plateau, 1.

New Mexico: Chusca Mountains, 3; Costilla Pass, 5; Costilla River, 3; Gallinas Mountains (Rio Arriba County), 7; Halls Peak, 1; Hondo Canyon, 1; Hopewell, 6; Horse Lake, 6; Jemez Mountains (head of Santa Clara Creek), 5; Moreno Valley, 2; Mount Taylor, 1; Pecos Baldy, 4; Red River (Taos County), 4; Taos Mountains, 4; Tres Piedras, 1; Tusas River, 1; Twining, 12; Whites Peak, 1; Willis, 4.

Utah: Beaver Mountains, 9; Buckskin Valley, 1; Fish Lake, 4; La Sal Mountains, 1; Panguich Lake, 1; Parawan Mountains, 4.

Wyoming: Bridgers Peak (8,800 feet altitude), 3; Medicine Bow Mountains (10,200 feet), 1.

THOMOMYS BRIDGERI Merriam.

Fort Bridger Pocket Gopher.

(Pl. VII, fig. 15.)

Thomomys bridgeri Merriam, Proc. Biol. Soc. Washington, XIV, 113, July 19, 1901.

Type.—Collected at Fort Bridger, Wyoming (exact locality, Harvey's Ranch on Smiths Fork, 6 miles southwest of Old Fort Bridger), by Vernon Bailey, May 27, 1890. Type specimen in U. S. Nat. Mus., Merriam collection.

Distribution.—Southwestern Wyoming and southeastern Idaho (Transition Zone) (fig. 5).

Characters.—Size large; ears large and prominent; color dull dark brown; skull heavily ridged and angular, with deeply emarginate nasals; mammæ in 5 pairs, inguinal 2–2, pectoral 3–3.

Color.—Summer pelage: Upperparts rich warm brown, nearest to cinnamon-brown of Ridgway; nose and face dusky brown; large ear patch black; underparts dark buffy or dull ochraceous, occasionally with white patch on chin; feet partly gray or mottled with gray; toes whitish; tail brownish gray, paler below and occasionally with white tips. *Winter pelage:* Upperparts duller and darker, more nearly Prout's brown of Ridgway; nose plumbeous, ear patch black; underparts washed with buffy over light plumbeous, with almost a lavender effect. *Young* more grayish.

Skull.—Large, angular, and heavily ridged in adults; nasals long and deeply emarginate at posterior tips; temporal ridges parallel or slightly converging in middle; interparietal triangular; audital bullæ long, narrow, and wide apart, with wide shaft of basioccipital

between; auditory meatus moderately large. *Dentition* relatively light; incisors very long and slightly protruding.

Measurements.—Type (♂ ad.): Total length, 237; tail vertebræ, 71; hind foot, 34. Topotype (♀ ad.): 227, 68, 31. Average of 10 adult males: 244, 72, 33.2. Average of 10 adult females: 233, 71, 31.5. *Ear:* From crown, 8. *Skull* (of type): Basal length, 39; nasals, 16; zygomatic breadth, 24.5; mastoid breadth, 22; interorbital breadth, 7; alveolar length of upper molar series, 8.

Remarks.—This big gopher is abundant in fertile valleys in the Transition Zone, but does not inhabit the arid upland. It is a strongly marked, outlying form of the *fossor* group, and its nearest relative is *uinta*. It has a lower zonal range, however, and seems to be entirely distinct. More thorough collecting may show that it grades into *uinta* higher up the streams, but at present the two are best treated as distinct species.

At the type locality females were found normally to have 10 mammæ and 5 embryos, as contrasted with the 14 mammæ and 7 embryos in the little *ocius* of the dry sagebrush mesas close by.

Specimens examined.—Total number, 74, as follows:

Idaho: Montpelier, 18; Montpelier Creek (6,000 feet altitude), 1.

Wyoming: Bear River (14 miles north of Evanston, 6,600–6,800 feet altitude), 5; Border, 1; Cokeville (6,400 feet), 8; Fort Bridger, 24; Henry's Fork (5 miles west of Lonetree), 1; Lonetree (7,400 feet), 3; Lonetree (4 miles south), 2; Mountain View, 11.

THOMOMYS UINTA Merriam.

Uinta Pocket Gopher.

(Pl. VII, fig. 14.)

Thomomys uinta Merriam, Proc. Biol. Soc. Washington, XIV, 112, July 19, 1901.

Type.—Collected in Uinta Mountains (10,000 feet altitude, north base of Gilbert Peak), Summit County, Utah, by Vernon Bailey, June 6, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Western Wyoming, southeastern Idaho, and northern Utah (fig. 5).

Characters.—About the size of *fossor* and practically indistinguishable in external characters; skull shorter and wider, with shorter rostrum and heavier dentition; mammæ in 5 pairs, inguinal 2–2, pectoral 3–3.

Color.—Summer pelage: Upperparts dull dark brown, with dusky nose and face and blackish ear and ear patch; underparts buffy or ochraceous, with occasionally a white patch on chin; feet and tip of tail usually whitish. *Late fall and winter pelage:* Duller and more grayish. *Young,* paler, more buffy than adults.

Skull.—Heavier and wider than in *fossor*, with heavier dentition, smaller bullæ, a more nearly five-angled interparietal, and wider nasals with deeply emarginate instead of rounded posterior tips.

Measurements.—Average of type and topotype (♂ ad.): Total length, 226; tail vertebræ, 70; hind foot, 31. Topotype (♀ ad.): 211, 64, 28. *Skull* (of type): Basal length, 35; nasals, 13; zygomatic breadth, 23; mastoid breadth, 21; alveolar length of upper molar series, 8.

Remarks.—While very similar to its nearest relative, *fossor*, in external characters, *uinta* has such pronounced skull characters and is so widely separated that it is best treated as a full species. It also has the same boreal, mountain habitat and practically the same environment and habits as *fossor*. Specimens from the mountains of western Wyoming show some local variation but not sufficient to be recognized as a subspecies. There seems to be no evidence of intergradation with the smaller and smaller-eared *fuscus* group, although they come close together in the region south of Jackson Hole, Wyo.

Specimens examined.—Total number 110, as follows:

Idaho: Albion, 5; Blackfoot (hills east of town), 1; Bridge, 1; Inkom, 12; Irwin (10 miles southeast), 7; Malade, 6; Pocatello, 4; Preuss Mountains, 5; Shelley, 3; Swan Lake, 4.

Utah: Kelton (mountains 7 miles north), 3; Ogden, 6; Park City, 3; Parley Canyon, 1; Uinta Mountains (9,000–10,000 feet altitude), 6.

Wyoming: Afton, 7; Afton (10 miles southeast, in Salt River Mountains), 6; Afton (10 miles north on Salt River), 7; Black Rock Creek (head, in Shoshone Mountains), 5; Kendall (12 miles north), 6; Merna, 6; Needle Mountain (10,000 feet altitude), 4; Stanley (3 miles west), 1; Thayne, 1.

THOMOMYS QUADRATUS QUADRATUS Merriam.

Dalles Pocket Gopher.

(Pl. VII, fig. 8.)

Thomomys quadratus Merriam, Proc. Biol. Soc. Washington, XI, 214, July 15, 1897.

Type.—Collected at The Dalles, Oregon, by Clark P. Streator, November 2, 1893. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Plains of eastern and central Oregon, northeastern California, and northwestern Nevada (fig. 5).

Characters.—Smaller than *uinta;* rather brighter colored; ears small; skull relatively short and wide, with wide, truncate, posterior tip of nasals; mammæ in 5 pairs, inguinal 2–2, pectoral 3–3.

Color.—*Summer pelage:* Upperparts light russet; ear patch black; nose dark plumbeous; underparts washed with dark buff; tail brownish above, except at tip; feet whitish. *Winter pelage:* Duller and grayer. *Young,* dull and rather dark.

Skull.—Relatively short and rectangular, with parallel lateral ridges, and rectangular zygomatic arches; nasals short and posteriorly truncate; pterygoids V-shaped; interparietal small, rounded, triangular, or cordate; bullæ rather small.

Measurements.—Average of 3 male topotypes: Total length, 210; tail vertebræ, 64; hind foot, 27. Average of 5 female topotypes: 195, 62, 26.4. *Skull* (of type): Basal length, 36; nasals, 13.5; zygomatic breadth, 24; mastoid breadth, 19; alveolar length of upper molar series, 8.

Remarks.—This is a wide-ranging, variable form of the *fossor* group, occupying the Upper Sonoran plains of eastern and central Oregon, northeastern California, and northern Nevada, and extending higher up in some of the narrow desert ranges.

Specimens examined.—Total number, 159, as follows:

California: Bieber, 7; Brownell, 1; Dry Creek (at 4,450 feet altitude), 1; Eagle Lake, 2; Goose Lake, 1; Goose Lake Meadows (4,800 feet), 2; Lake City, 1; Lassen Creek, 7; Madeline Divide, 1; Madeline Plains, 6; Pete's Valley, 1; Secret Valley, 1; Sugar Hill (Modoc County, 5,000 feet), 1; Susanville (4 miles south), 2; Warner Mountains (head of Parker Creek, 7,300 feet), 16; Warner Mountains (Parker Creek, 5,500 feet), 13; Warner Peak (east slope, 8,700 feet), 3.

Nevada: Badger, 1.

Oregon: Adel, 4; Crooked River, 3; Fremont, 4; Harney, 2; Ironside (4,000 feet altitude), 11; Lake Alvord, 1; Lakeview, 4; Matoleus River, 2; Merrill, 2; Mount Warner, 1; Shirk, 17; Silver Lake, 6; The Dalles, 21; Tumtum Lake, 1; Wapinitia, 1.

Washington: Rockland, 12.

THOMOMYS QUADRATUS FISHERI Merriam.

Fisher Pocket Gopher.

(Pl. VII, fig. 16; text fig. 3.)

Thomomys fuscus fisheri Merriam, Proc. Biol. Soc. Washington, XIV, 111, July 19, 1901.

Type.—Collected at Beckwith, Sierra Valley, Plumas County, California, by W. K. Fisher, August 3, 1900. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Northern, central, and western Nevada; west in California to Sierra Valley and Mono Lake (fig. 6).

Characters.—Slightly smaller than *quadratus*, shorter-tailed, and paler; smaller than *clusius*, about the same color but with narrower skull and smaller bullæ; much larger than *idahoensis* with relatively smaller bullæ; claws moderately stout; mammæ in 5 pairs, inguinal 2–2, pectoral 3–3.

Color.—*Summer pelage:* Upperparts buffy gray, lightly washed with dull russet over back; ear patch blackish; nose plumbeous; underparts buffy; chin white; feet whitish; tail whitish below, gray

above usually to the tip. *Winter pelage:* Slightly grayer. *Young,* more buffy.

Skull.—More like that of *quadratus* than of *fuscus* or *monticola;* lateral ridges parallel in adults; nasals truncate posteriorly; interparietal broadly triangular. *Dentition* lighter, and incisors less abruptly decurved than in *quadratus, fuscus,* or *monticola.*

Measurements.—Average of 3 topotypes (♂ ad.): Total length, 191; tail vertebræ, 58; hind foot, 25.3. Average of 3 adult females: 194, 58, 25. *Skull* (of type, ♂ ad.): Basal length, 31; nasals, 11; zygomatic breadth, 20; mastoid breadth, 17.5; alveolar length of upper molar series, 6.

Remarks.—The subspecies *fisheri* is typical only along the western part of its range. In central Nevada it is darker and perhaps grades into *uinta.* In northwestern Nevada it grades imperceptibly into *quadratus,* the only form with which it seems to be closely connected. It is quite distinct from *monticola,* with which it occurs at the type locality, and from which it differs in much smaller ears and paler color.

Specimens examined.—Total number, 97, as follows:

California: Beckwith, 1; Casa Diablo, 6; Mono Lake, 8; Sierra Valley, 8.

Nevada: Arc Dome, 2; Big Creek 6; Bull Run, 2; Cottonwood Range, 14; Eureka, 3; Monitor Mountains, 2; Mount Siegel, 2; Mount Sugar, 6; Pine Forest Range, 4; Reese River Valley (50 miles south of Austin), 9; Reno, 6; Ruby Lake, 3; Ruby Mountains, 2; Silver Creek (north of Austin), 5; Summit Lake, 3; Verdi, 3; Wells, 2.

Thomomys douglasi Group.

THOMOMYS DOUGLASI DOUGLASI (Richardson).

Douglas Pocket Gopher; Columbia Sand Rat.

(Pl. II, fig. 10; Pl. VIII, fig. 5.)

Geomys douglasii Richardson, Fauna Boreali-Americana, I, 200, 1829.

Geomys fuliginosus Schinz, Syn. Mamm., II, 136, 1845. "Habitat ad fluvium Columbia."

Thomomys douglasii Allen, Bul. Am. Mus. Nat. Hist., V, 66, April 28, 1893.

Type.—Collected "near the mouth of the Columbia," at Fort Vancouver, Washington, by David Douglas, probably in 1825. Mr. Oldfield Thomas writes that it is not now in the British Museum collection.

Distribution.—Known only from type locality (fig. 5).

Characters.—Size medium; claws stout; ears medium with rounded tips; color nearly uniform dull hazel without dark ear patch; skull long and slender and flat on top; incisors abruptly decurved and distinctly grooved; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—(*June specimens* from type locality): Upperparts uniform dull hazel, slightly paler on sides; underparts more ochraceous, with

a white spot on breast in all of the topotypes; nose gray; feet and tail soiled whitish. *Winter and young pelages* not seen.

Skull.—Long and narrow, somewhat of the *monticola* type, but with heavier rostrum, wider interorbital constriction, and with zygomatic arches conspicuously widest at anterior angle; interparietal very small and transversely oval; bullæ small and narrow; basioccipital triangular; pterygoids low and U-shaped.

Measurements.—Average of 3 topotypes (♂ ad.): Total length, 215; tail vertebræ, 64; hind foot, 30. Average of 4 females: 200, 58, 28.6. *Skull* (of topotype, ♂ ad.):[1] Basal length, 36; nasals, 14; zygomatic breadth, 22.5; interorbital breadth, 7; mastoid breath, 19; alveolar length of upper molar series, 7.6.

Remarks.—The well-developed ears, number and position of mammæ, general tone of coloration, and long narrow skull at first suggest *douglasi* as the type of the *monticola* group, but the heavier claws, more rounded ear tips, heavier rostrum, and wider interorbital region seem to be group characters shared only by *douglasi*, *oregonus*, *yelmensis*, *melanops*, *limosus*, and *niger*. This group of isolated forms may somewhere connect with *mazama*, which seems to be its nearest relative and neighbor, but for convenience it may be termed the *douglasi* group. With the smaller-eared, slenderer-clawed *fuscus* group, it seems less closely connected. From *quadratus* and *columbianus* it differs widely in external as well as cranial characters.

Specimens examined.—Total number, 7, as follows:

Washington: Vancouver (6 or 7 miles northeast, at Fourth Plain), 7.[2]

THOMOMYS DOUGLASI OREGONUS Merriam.

Oregon Pocket Gopher.

(Pl. VIII, fig. 8.)

Thomomys douglasi oregonus Merriam, Proc. Biol. Soc. Washington, XIV, 115, July 19, 1901.

Type.—Collected at Ely, near Oregon City, Oregon (exact locality in Ely's orchard), by Clark P. Streator, October 24, 1893. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Known only from type locality (fig. 5).

Characters.—Size about as in *douglasi*; ears smaller, but of the same rounded form; color brighter hazel; skull relatively shorter and wider, with distinctly triangular interparietal; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—October specimens in thin summer pelage: Upperparts clear bright hazel, with dusky nose and cheeks and blackish ear patch;

[1] No. 65929, U. S. Nat. Mus. [2] Collected by Clark P. Streator, June 15–16, 1894.

underparts paler, more ochraceous; feet and tail soiled whitish. *Young* of the year, paler, more yellowish. A trace of long, rough fur on the rumps of several breeding females is duller and darker, more like the June pelage of *douglasi*.

Skull.—Relatively shorter and wider than in *douglasi*, with more-spreading and more nearly parallel zygomatic arches, triangular interparietal, larger bullæ, V-shaped instead of U-shaped interpterygoid fossa, and heavier molars; nasals narrow, with generally double rounded posterior tips.

Measurements.—Average of 5 topotypes (♂ ad.): Total length, 216; tail vertebræ, 67; hind foot, 29.5. Type (♂ ad.): 220, 70, 30. Average of 5 adult females: 210, 66, 28.2. *Skull* (of type): Basal length, 36; nasals, 14; zygomatic breadth, 23.7; interorbital breadth, 6.5; mastoid breadth, 19.4; alveolar length of upper molar series, 7.6.

Remarks.—The relationship between *douglasi* and *oregonus* is not very close and the question of continuity of range has not been worked out. The Columbia River probably separates their ranges, but they are near enough in characters to allow subspecific rank to show their relationship.

Specimens examined.—Twenty-eight, from type locality.

THOMOMYS DOUGLASI YELMENSIS Merriam.

Yelm Pocket Gopher.

(Pl. VIII, fig. 11.)

Thomomys douglasi yelmensis Merriam, Proc. Biol. Soc. Washington, XIII, 21, Jan. 31, 1899.

Type.—Collected at Tenino, Yelm Prairie, Thurston County, Washington, by Clark P. Streator, October 24, 1891. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Prairies around south end of Puget Sound, Wash. (fig. 5).

Characters.—Very similar to *douglasi*, but with more-pointed ears, duller and darker coloration, and conspicuous black ear patches; zygomatic arches not widest at anterior angle.

Color.—In faded October pelage: Upperparts dull hazel; nose and sides of face dusky; ears and large ear patches blackish; underparts buffy with irregular white patches; two specimens with white spots on breast and one with white spots on side; feet and tail white or soiled whitish. *Winter pelage* (just appearing on heads in October specimens) dark umber on crown.

Skull.—Long and low like that of *douglasi;* slightly concave interorbitally; zygomatic arches parallel or widest posteriorly; interpterygoid fossa more nearly V-shaped; nasals narrower and more deeply emarginate at posterior tips.

Measurements.—Type (♂ ad.): Total length, 222; tail vertebræ, 68; hind foot, 32. *Skull* (of type): Basal length, 35.5; nasals, 15; zygomatic breadth, 22.7; interorbital breadth, 6.6; mastoid breadth, 18; alveolar length of upper molar series, 7.7.

Remarks.—This is a well-marked form of the *douglasi* group probably not occurring beyond the margins of the Puget Sound prairies. The heavily timbered areas of western Washington and Oregon seem to exclude pocket gophers, but the scattered colonies of related forms strongly suggest a time when the valley prairies were more extensive in area, and the range of the gophers more or less continuous from Puget Sound to the Umpqua Valley. Isolated colonies have become more or less differentiated in characters. Even those from Roy, Spanway, and Steilacoom, Wash., differ to some extent from the type series from Tenino, but not sufficiently for separation.

Specimens examined.—Total number, 44, as follows:

Washington: Roy, 19; Spanway, 6; Steilacoom, 16; Tenino, 3.

THOMOMYS DOUGLASI MELANOPS Merriam.

Black-Headed Pocket Gopher.

(Pl. VIII, fig. 6.)

Thomomys melanops Merriam, Proc. Biol. Soc. Washington, XIII, 21, Jan. 31, 1899.

Type.—Collected at timberline at head of Soleduck River, Olympic Mountains, Clallam County, Washington, by C. Hart Merriam and Vernon Bailey, August 28, 1897. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Olympic Mountains, Wash. (fig. 5).

Characters.—About the size and color of *yelmensis*, but with more black on nose and head; ears small and pointed; skull long, with upper outline more arched than in *yelmensis* or *douglasi;* pterygoids small and wide apart.

Color.—August pelage: Upperparts dark russet, with dusky nose and face, and large black ear patches; underparts paler, more ochraceous, usually with white chin, wrists, and lining of cheek pouches; fore feet pure white; hind feet and tip of tail whitish.

Skull.—Long and well arched; lower outline of rostrum constricted; nasals long and deeply emarginate; premaxillæ wide; interparietal very small and oval or circular; bullæ narrow, and basioccipital wide between them; pterygoids high and wide apart.

Measurements.—Type (♀ ad.): Total length, 206; tail vertebræ, 63; hind foot, 27. Topotype (♀ ad.): 202, 58, 27. There are no adult males from the type locality and those from Happy Lake, Wash., are not correctly measured. *Skull* (of type): Basal length, 33; nasals, 13; zygomatic breadth, 20; mastoid breadth, 16; interorbital breadth,

6.4; alveolar length of upper molar series, 7.3. Skull of adult male from Happy Lake: 34.6; 14.3; 22; 17; 6.3; 7.

Remarks.—Only females and one young male of this form have been examined from the type locality, and in these the cranial characters are not perfectly shown. Specimens of adult male and female from Happy Lake, near the type locality, in the collection of the Field Museum, indicate a closer relationship with *yelmensis* and *douglasi* than was formerly supposed. The relationship of the form seems best indicated by considering it a subspecies of *douglasi*, although at present direct geographic connection is improbable.

Specimens examined.—Total number, 14, as follows:

Washington (Olympic Mountains): Happy Lake, 9; Soleduck River (head), 5.[1]

THOMOMYS LIMOSUS Merriam.

White Salmon Pocket Gopher.

(Pl. VIII, fig. 12.)

Thomomys limosus Merriam, Proc. Biol. Soc. Washington, XIV, 116, July 19, 1901.

Type.—Collected at White Salmon, gorge of the Columbia, Klickitat County, Washington, by J. Alden Loring, June 26, 1897. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Known only from type locality (fig. 5).

Characters.—Size and proportions of *douglasi*, but darker colored and with blackish ear patch; skull shorter and wider.

Color.—June pelage: Upperparts dull chestnut, with plumbeous nose and blackish ear patches; underparts slightly paler, more ochraceous; in about half the specimens a white spot on breast; feet and tail soiled whitish. *Young:* Half-grown specimens very similar to adults, but slightly paler, and belly more buffy.

Skull.—Relatively short and wide with more arched dorsal outline and wide-spreading zygomata; nasals with emarginate, spreading, posterior tips, terminating approximately even with tips of premaxillæ; bullæ low and narrow, and anterior shaft of basioccipital correspondingly wide between them; pterygoids small, with narrow fossa.

Measurements.—Type (♂ ad.): Total length, 224; tail vertebræ, 68; hind foot, 30. Average of 3 topotypes (♂ ad.): 224, 69, 29.3. Topotype (♀ ad.): 216, 66, 27. *Skull* (of type): Basal length, 34.5; nasals, 14; zygomatic breadth, 23.5; mastoid breadth, 20; interorbital breadth, 6.2; alveolar length of upper molar series, 8.

Remarks.—While so strikingly different from *douglasi* as to require specific rank, this form is included in the *douglasi* group because of its prominent, rounded ear, heavy claws, and general skull characters

[1] Two adult and two immature females, and one immature male.

It is in all probability an isolated form but evidently of ancestral connection with *douglasi*.

Specimens examined.—Six skins and seven skulls, from type locality.[1]

THOMOMYS NIGER Merriam.

Black Pocket Gopher.

(Pl. VIII, fig. 7.)

Thomomys niger Merriam, Proc. Biol. Soc. Washington, XIV, 117, July 19, 1901.

Type.—Collected at Seaton, near mouth of Umpqua River, Douglas County, Oregon, by J. Ellis McLellan, October 6, 1894. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Coast region of west-central Oregon (fig. 5).

Characters.—About the size of *douglasi*, to which it shows nearest relationship in its heavy claws and rounded ear; skull heavier, shorter; rostrum depressed; upper incisors curved inward; color black; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Upperparts uniform glossy black with purple and green iridescence; underparts duller and more plumbeous; feet and distal portion of tail white. *Young*, sooty black.

Skull.—Shorter, wider, and heavier than in *douglasi*, with heavier rostrum; nasals posteriorly sulcate, with the anterior half abruptly widened, and the posterior tips sharply emarginate; interparietal small; bullæ fuller and more rounded than in *douglasi;* pterygoids thick and wide apart. *Dentition* heavier.

Measurements.—Type (♂ ad.): Total length, 225; tail vertebræ, 81; hind foot, 30. Female topotype: 214, 71, 30. *Skull* (of type): Basal length, 33.5, nasals, 14; zygomatic breadth, 22.5; mastoid breadth, 18; interorbital breadth, 6; alveolar length of upper molar series, 8.

Remarks.—This is probably a dichromatic species of which as yet only specimens of the black phase have been secured. The cranial characters place it with *douglasi* in a group of related but not closely connected forms.

Specimens examined.—Total number, 22, as follows:

Oregon: Mapleton, 8; Mercer, 7; Scottsburg (2 miles east), 1 (albino);[2] Seaton, 6.

Thomomys monticola Group.

THOMOMYS MONTICOLA MONTICOLA Allen

California Mountain Pocket Gopher.

(Pl. II, figs. 9, 9′; Pl. VIII, fig. 1.)

Thomomys monticolus Allen, Bul. Am. Mus. Nat. Hist., V, 48, Apr. 28, 1893.

Type.—Collected on Mount Tallac, California, at 7,500 feet altitude, by W. W. Price, August 8, 1892. Type specimen in Am. Mus. Nat. Hist.

[1] Collected June 26, 1897, by J. Alden Loring. Two are half-grown, the others adults.

[2] Without skull and not certainly identified.

Distribution.—Sierra Nevada of California and Nevada, from Lassen Peak south to Mammoth Pass (fig. 5).

Characters.—Size small; feet and claws very slender; ears large, thin, well formed, and pointed; skull long and slender, with anteriorly converging lateral ridges; colors dull hazel above, buffy below; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—*Winter pelage:* Upperparts dull hazel with blackish ear patch and plumbeous nose; underparts and feet dull buffy; tail whitish throughout or dusky above at base. *Summer pelage:* Slightly clearer, brighter tawny. *Young,* somewhat paler, more yellowish than adults.

Skull.—Long, slender, and low; rostrum slender, especially in profile, abruptly arched anterior to molars; zygomata very slender; interparietal usually transversely oval, wider than long; nasals long, slender, and slightly emarginate or doubly rounded at posterior tips, reaching near tips of premaxillæ; bullæ very small; lateral pits of palate deep. *Dentition* light; upper incisors abruptly decurved at right angles to axis of skull, not protruding beyond tip of nasals, and distinctly grooved.

Measurements.—Average of 5 adult males from Emerald Bay, near type locality: Total length, 212; tail vertebræ, 70; hind foot, 27.4. Average of 5 adult females: 209, 67, 26.4. *Skull* (of type, from original description): Basilar length, 34; greatest breadth, 22; interorbital breadth, 6; nasals, 14. Skull (of topotype, ♂ ad.):[1] Basal length, 32; nasals, 12.5; zygomatic breadth, 20; mastoid breadth, 17; interorbital breadth, 6.2; alveolar length of upper molar series, 7.

Remarks.—While most nearly related to the *fuscus* and *fossor* groups, *monticola* and the other subspecies, *mazama, pinetorum, nasicus,* and *helleri,* form a well-defined group. The typical subspecies appears to overlap the range of *fisheri* in Sierra Valley and actually to meet the ranges of other surrounding forms. It is mainly a Canadian Zone species, but locally extends into the Hudsonian and to a lesser extent down into the Transition Zone.

Specimens examined.—Total number, 360, as follows:

California: American River (head of South Fork), 2; Aspen Meadows, 2; Big Trees, 3; Bloods, 1; Blue Canyon, 8; Blue Lake, 3; Buck's Ranch, 2; Burney (12 miles west), 1; Calaveras Big Trees, 3; Carberry Ranch, 8; Cisco (Placer County), 25; Clouds Rest (near, meadow above Little Yosemite), 2; Donner, 21; Donner Lake, 3; Echo, 16; Emerald Bay, 24; Fallen Leaf Lake, 9; Gardners, 1; Gates Creek, 1; Greenville (8 miles west), 2; Hat Creek (head), 1; Heather Lake (Eldorado County), 1; Hermit Valley, 2; Hope Valley, 7; Independence Lake, 18; Independence Lake (pass west of), 1; Lassen Peak (north slope), 9; Lincoln Creek (Sierra County), 1; Little Yosemite, 2; Long Valley (Willow Ranch), 1; McCloud (12 miles northeast), 1; McKinneys, 13; Markleeville, 11; Milford, 4; Mill Creek (Mount Lassen), 2; Mokelumne River (head), 2; Mono Pass, 3; Mount Conness, 4; Mount Dana, 8; Mount Lyell, 1; Mount

[1] No. 100274, U. S. Nat. Mus., from Camp Agassiz, on Mount Tallac.

Shasta, 26; Mount Tallac, 36; Mount Unicorn, 3; Pacific Creek, 1; Pine City (or Mammoth), 3; Pine Creek, 1; Pyramid Peak, 1; Robbins Creek (Lassen County), 1; San Joaquin River (head), 1; Sierra Valley, 9; Silver Lake, 8; Slippery Ford, 1; Sonora Pass, 4; Tallac, 1; Tenaya Lake, 2; Tuolumne Meadows, 20; Warner Creek (Mount Lassen), 1; West Walker River, 2.

Nevada: Carson, 1; Glenbrook, 7; Sugar Loaf (Douglas County), 2.

THOMOMYS MONTICOLA MAZAMA Merriam.

Mazama Pocket Gopher.

(Pl. VIII, fig. 2.)

Thomomys mazama Merriam, Proc. Biol. Soc. Washington, XI, 214, July 15, 1897.

Type.—Collected at Anna Creek (near Crater Lake), Mount Mazama, Klamath County, Oregon, at 6,000 feet altitude, by Edward A. Preble, September 3, 1896. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Cascade and Siskiyou Mountains, Oreg., south in California to the Trinity Mountains (fig. 5).

Characters.—About the size of *monticola*, but darker and richer colored; ears nearly as large, and bullæ larger and more rounded; rostrum shorter, with less slender nasals; zygomatic arches more abruptly spreading; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts bright russet-brown; ear patch blackish; nose plumbeous; underparts rich buff or ochraceous; feet and tail whitish, tail usually gray above at base. *Winter pelage* unknown. *Young* slightly paler than adults.

Skull.—Not so long and slender as in *monticola;* nasals sharply emarginate posteriorly and more spreading anteriorly; anterior base of zygoma thin and prolonged against premaxilla. *Dentition* slightly heavier than in *monticola.*

Measurements.—Average of 4 topotypes (♂ ad.): Total length, 209; tail vertebræ, 66; hind foot, 28. Average of 4 adult females: 202, 66, 28.7. *Skull* (of type, ♂ ad.): Basal length, 35; nasals, 13; zygomatic breadth, 21; mastoid breadth, 17; interorbital breadth, 6.5; alveolar length of upper molar series, 7.5.

Remarks.—From *monticola* and *pinetorum, mazama* is readily distinguished by its shorter, wider, emarginate nasals and larger bullæ; from the *douglasi* group, by smaller size, slenderer skull, lighter dentition, V-shaped instead of U-shaped pterygoids, and deeper lateral pits of palate; from *quadratus,* by larger ears, slenderer skull, and emarginate nasals. It occupies the Canadian Zone and to some extent the Transition also.

Specimens examined.—Total number, 294, as follows:

California: Bear Creek (head of, Trinity County, at 6,400 feet altitude), 62; Beswick (6 miles southwest, 6,000 feet), 1; Castle Lake (Siskiyou County, 5,400 feet), 8; Coffee Creek (north fork, Trinity County, 4,500 feet), 15; Grizzly Creek (Trinity County, 6,000 feet), 2; Jackson Lake (Siskiyou County), 13; Picard (Elgin Ranch), 1; Rush Creek (head of, Siskiyou County,

6,400 feet), 63; Salmon Creek Divide (Siskiyou County), 4; Salmon River (south fork, 5,000 feet), 5; Scott River (6 miles northwest of Callahans), 8; Siskiyou Mountains (6,000–7,000 feet on White Mountain and Craggy Peak and in Studhorse Canyon), 22; Taylor Fork of Salmon River (5,000 feet), 2; Trinity Mountains (west end, 5,700 feet), 5.

Oregon: Anna Creek (Mount Mazama), 3; Ashland Peak, 2; Crater Lake (Mount Mazama), 5; Diamond Lake, 7; Fort Klamath, 13; Grizzly Peak (near Ashland), 1; McKenzie Bridge, 19; Mount Hood (west slope, 6,000 feet), 5; Mount Hood (Summit House at southern base), 5; Prospect, 1; Siskiyou Mountains, 2; Sisters (north base), 3; Three Sisters (town), 17.

THOMOMYS MONTICOLA PINETORUM Merriam.

Yellow Pine Pocket Gopher.

(Pl. VIII, fig. 3.)

Thomomys monticola pinetorum Merriam, N. Am. Fauna No. 16, 97, Oct. 28, 1899.
Thomomys monticola premaxillaris Grinnell, Univ. of Cal., Pub. Zool., XII, 312, Nov. 21, 1914. Collected on South Yolla Bolly Mountain, at 7,500 feet altitude, by G. Ferris, Aug. 6, 1913. Type specimen in Mus. Vert. Zool., Univ. of California.

Type.—Collected at Sisson, west base of Mount Shasta, California, by R. T. Fisher, September 4, 1898. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Mountains along west side of Sacramento Valley, Cal., from Sisson south to South Yolla Bolly Mountain (fig. 5).

Characters.—Very similar to *monticola*, but upperparts brighter, more golden brown; nose and cheeks conspicuously gray.

Color.—Summer pelage: Upperparts yellow-hazel, such as is seen in yellow-pine bark, but never in color keys; ear patch blackish; nose and cheeks conspicuously plumbeous or grayish, often extending back to or beyond ears; underparts buffy; tail and feet gray or whitish. *Winter pelage:* Slightly duller than in summer. *Young*, paler than adults.

Skull.—Similar to that of *monticola*, but with nasals more conspicuously emarginate at posterior tips, and falling 1 to 2 mm. short of tips of premaxillæ; interparietal smaller and more rounded, and lateral ridges more nearly parallel in adults.

Measurements.—Type (♂ ad.): Total length, 210; tail vertebræ, 76; hind foot, 28. Average of 5 topotypes (♀ ad.): 200, 73, 27.6. *Skull* (of type, ♂ ad.): Basal length, 33; nasals, 13; zygomatic breadth, 20; mastoid breadth, 18; interorbital breadth, 6; alveolar length of upper molar series, 7.

Remarks.—In series of specimens from South Yolla Bolly Mountain [1] and from the head of Grindstone Creek, still farther south, the

[1] *Thomomys monticola premaxillaris* Grinnell differs from *pinetorum* in a slight accentuation of the same characters that separate that form from *monticola*. The premaxillæ extend 2 mm. back of the nasals in the type of *pinetorum*, 2½ mm. in the type of *premaxillaris*, while in *monticola* they are approximately even with it. The nasals in *premaxillaris* are decidedly narrower and more deeply emarginate than in *monticola* but very slightly more so than in *pinetorum*. The types of *premaxillaris* and *pinetorum* are indistinguishable in coloration. To recognize *premaxillaris* would seem to me to be splitting one rather poor subspecies in two.

characters of *pinetorum* are slightly accentuated, but not sufficiently for further subdivision. Specimens from Wagon Camp are to some extent intermediate between *pinetorum* and *monticola*, while from higher up Mount Shasta they are typical of *monticola*. Others from half a mile west of Sisson distinctly approach *mazama*. Apparently *pinetorum* is a Transition Zone form extending from Sisson south through the mountains along the west side of the Sacramento Valley.

Specimens examined.—Total number, 54, as follows:

California: Grindstone Creek (head), 5; Sisson, 9; South Yolla Bolly Mountain, 40.

THOMOMYS MONTICOLA NASICUS Merriam.

Deschutes Pocket Gopher.

(Pl. VIII, fig. 4.)

Thomomys nasicus Merriam, Proc. Biol. Soc. Washington, XI, 216, July 16, 1897.

Type.—Collected at Farewell Bend, Deschutes River, Crook County, Oregon (west of Prineville), by Edward A. Preble, August 4, 1896. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—West-central Oregon (east of the Cascades), from Farewell Bend, Deschutes River, south to the Yamsey Mountains (fig. 5).

Characters.—Size and proportions of *monticola;* ears large and conspicuous; color slightly lighter and brighter; skull long and narrow, with long spreading nasals.

Color.—Summer pelage: Upperparts bright yellowish hazel with plumbeous nose and ear patches; underparts rich buff; feet, most of tail and chin usually whitish. *Winter pelage:* Duller hazel. *Young,* paler and duller colored.

Skull.—Long, with narrow braincase and long rostrum; nasals long and conspicuously widened anteriorly, almost spoon-shaped in some individuals, sharply emarginate at posterior tip; interparietal small and transversely oval; bullæ rather small.

Measurements.—Type (♂ ad.): Total length, 214; tail vertebræ, 69; hind foot, 27. *Skull* (of type): Basal length, 34.7; nasals, 15.4; zygomatic breadth, 21.5; mastoid breadth, 16.8; alveolar length of upper molar series, 7.

Remarks.—The subspecies *nasicus* seems to be a well-marked form of the *monticola* group, with skull characters placing it nearer *monticola* (from which it is widely separated geographically), than to its nearest neighbor, *mazama*, while in color it is very close to *pinetorum*, with which it also agrees in a Transition Zone range. Its relationship can best be shown by placing it as a subspecies of *monticola.*

Specimens examined.—Total number, 49, as follows:

Oregon: Bend, 12; Deschutes River (Farewell Bend), 2; Deschutes River (mouth of Davis Creek), 8; Fort Klamath, 1; Lapine, 12; Little Meadows, 1; Paulina Lake, 6; Pengra, 2; Yamsey Mountains, 9.

THOMOMYS MONTICOLA HELLERI Elliot.

HELLER POCKET GOPHER.

Thomomys helleri Elliot, Field Columb. Mus., zool. ser. III, 165, 1903.

Type.—Collected at Goldbeach, mouth of Rogue River, Oregon, by E. Heller, in 1901. No type designated. Type series in Field Mus. Nat. Hist.

Distribution.—Coast region of southwestern Oregon (fig. 5).

Characters.—About the size of *mazama*, but with darker richer coloration and slenderer skull.

Color.—October pelage: Upperparts dull chestnut or mars brown; sides and underparts becoming ochraceous; ear patches intense black; nose and face blackish, rarely a trace of white on lips; feet mottled or whitish; tip of tail usually white. *Young* of the year, duller colored.

Skull.—Similar to that of *mazama* but with narrower rostrum and nasals, smaller bullæ, and shorter pterygoids, with wider intervening fossa.

Measurements.—Average of 4 male topotypes: Total length, 203; tail vertebræ, 55; hind foot, 29. Average of 4 female typotypes: 195, 57, 27.2. *Skull* (of topotype ♂ ad.):[1] Basal length, 34; nasals, 14.3; zygomatic breadth, 22; mastoid breadth, 18.6; alveolar length of upper molar series, 7.5.

Remarks.—These gophers are abundant on the flats on both sides of the mouth of Rogue River but are not generally distributed on the coast nor back in the timbered interior. They form a partially isolated colony with their nearest relatives *mazama* on the open mountain ridges of the Coast Ranges and Cascades. Their group relationship is so clearly with *mazama* and *monticola* that it seems best to place them as a subspecies of *monticola*.

Specimens examined.—Total number, 19, as follows:

Oregon: Goldbeach, 11; Wedderburn (north side of river), 8.

Thomomys fuscus Group.

THOMOMYS FUSCUS FUSCUS Merriam.

BROWN POCKET GOPHER.

(Pl. VIII, figs. 13, 14; text fig. 4.)

Thomomys clusius fuscus Merriam, N. Am. Fauna No. 5, 69, July, 30, 1891.

Type.—Collected on mountains at head of Big Lost River, Idaho, at about 8,000 feet altitude, by B. H. Dutcher, September 23, 1890. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Southeastern British Columbia, greater part of northern and central Idaho and western Montana, northwestern Wyoming, and parts of eastern Washington and Oregon (fig. 5).

[1] No. 166949, U. S. Nat. Mus.

Characters.—Size rather small; feet slender; ears small and pointed; color light brown; skull slender, with large bullæ; dentition light; mammæ in 4 pairs, inguinal 2–2, pectoral 2–2.

Color.—Summer pelage: Upperparts light brownish or dull walnut-brown, not so dark as in *fossor* nor so bright as in *monticola* or *mazama;* ear patch black or blackish; nose plumbeous; underparts buffy; feet and tail soiled whitish or buffy; tail usually gray above at base. *Winter pelage:* Slightly duller than summer. *Young,* paler than adults.

Skull.—Light and slender with short rostrum and anteriorly converging lateral ridges; interparietal wide and oval; nasals short and truncate posteriorly, reaching nearly to tips of premaxillæ; bullæ full and rounded; pterygoids long and narrowly V-shaped; skulls of males and females very similar. *Dentition* light; upper incisors abruptly decurved and distinctly grooved.

Measurements.—Average of 3 topotypes (♂ ad): Total length, 203; tail vertebræ, 70; hind foot, 27. Average of 5 adult females: 205, 70, 27. *Skull* (of type, ♀ ad.): Basal length, 33; nasals, 12.4; zygomatic breadth, 20; mastoid breadth, 17; interorbital breadth, 6; alveolar length of upper molar series, 7.

Remarks.—This form is fairly typical in central Idaho, western Montana, and in the Blue Mountain region of Oregon. In northern Idaho, eastern Washington, and southern British Columbia it becomes noticeably darker, but retains more nearly the skull characters of *fuscus.* West of the Columbia River it varies greatly with almost every locality, but these local forms can be placed under *fuscus* better than with *quadratus* or *myops,* both of which they suggest.

Specimens examined.—Total number, 373, as follows:

British Columbia: Ashcroft, 1; Cascade, 6; Ducks, 5; Glacier, 1; Kamloops, 2; Midway, 6; Monashee Ridge (Gold Range, at 4,000 feet altitude, 5; at 3,620 feet, 4), 9; Myers Creek, 1; Nelson, 9; Okanogan, 10; Pend Oreille River, 11; Salmon River, 2; Shuswap, 20; Skagit Valley, 1; Trail, 1; Wards Ferry, 1.

Idaho: Ashton, 2; Big Lost River (head), 2; Blackfoot (west of river), 1; Blue Lake, 12; Cœur d'Alene, 4; Freedom (near mouth of South Fork Salmon River), 1; Hoodoo Valley, 1; Lemhi Indian Agency, 2; Lerdo, 1; Lost River Mountains, 5; Midvale, 7; Mission, 1; Mount Carlton, 3; New Meadows, 3; Salmon River Mountains, 11; Sawtooth Lake, 3; Seven Devils Mountains, 2; South Fork Ranch, 1; Teton Canyon, 1; Van Wyck, 1.

Montana: Beartooth Mountains, 3; Benton (west of), 1; Corvallis, 2; Flathead Lake, 4; Fort Ellis, 2; Little Bitterroot Creek, 1; Lo Lo, 1; Midvale, 2; Ross Fork, 1; St. Marys Lake, 3; Stevensville, 2; Summit (west of Blackfoot Station), 6; Thompson Falls, 8; Tobacco Plains, 10.

Oregon: Antelope, 2; Anthony, 14; Bingham Prairie, 1; Blue Mountains (10 miles north of Harney), 1; Elgin, 1; Huntington, 1; Wallowa Mountains, 8.

Washington: Blue Creek (13 miles east of Walla Walla), 3; Chelan, 2; Cheney, 1; Colfax, 1; Columbia County (25 miles southeast of Dayton and Humpeg Falls), 2; Colville, 6; Davenport, 1; Douglas, 2; Easton, 9; Fort Spokane, 1; Garfield, 1; Loon Lake, 2; Mabton, 3; Marcus, 5; Marshall, 11; Natches River, 1; North Yakima, 22; Orondo, 1; Pullman, 11; Rock Lake, 2; Spokane Bridge, 3; Spokane Falls, 15; Waterville, 1; Wenatchee, 8.

Wyoming: Black Mountains, 4; Moran, 4; Pahaska, 4; Pahaska Tepee, 12; Teton Mountains, 6; Teton Pass, 4; Yellowstone Lake, 1.

THOMOMYS FUSCUS SATURATUS Bailey.

Cœur d'Alene Pocket Gopher.

(Pl. VIII, fig. 16.)

Thomomys fuscus saturatus Bailey, Proc. Biol. Soc. Washington, XXVII, 117, July 10, 1914.

Type.—Collected at Silver (near Saltese) in the western corner of Missoula County, Montana, at 4,300 feet altitude, in the Cœur d'Alene Mountains, by Clark P. Streator, June 20, 1891. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Higher parts of the Cœur d'Alene Mountains in Idaho and Montana (fig. 5).

Characters.—Considerably larger than *fuscus*, with darker, richer coloration and less tendency to white markings below; skull long and high, with relatively narrower braincase and wider nasals.

Color.—Summer pelage: Upperparts dark rich hazel, becoming yellowish on sides, and this shading into a buffy wash on underparts; ear patches black; nose plumbeous; feet and tail buffy gray; rarely a trace of white on chin or throat. Only June and August specimens seen. The young are a shade paler than adults.

Skull.—Long and narrow with high, truncate occiput; lateral ridges prominent and nearly parallel; nasals widened anteriorly and emarginate posteriorly; premaxillæ very narrow posteriorly; bullæ wide and flattened; basioccipital relatively wide between bullæ.

Measurements.—Type (♂ ad.): Total length, 225; tail vertebræ, 77; hind foot, 30. Average of 3 adult males: 216, 72, 29. Average of 5 females: 211, 75, 28.7. *Skull* (of type): Basal length, 33.2; nasals, 13.7; zygomatic breadth, 21.4; mastoid breadth, 17; alveolar length of upper molar series, 7.

Remarks.—This seems to be a well-marked but rather local form of the *fuscus* group occupying the higher hemlock-covered part of the Cœur d'Alene Mountains. Specimens from Prospect Creek, lower down on the east slope, show intermediate characters approaching *fuscus* while others from Thompson Falls, at the east base of the mountains are almost typical of *fuscus*.

Specimens examined.—Total number, 26, as follows:

Idaho: Mullan, 3.

Montana: Prospect Creek, 6; Silver, 16; Thompson Pass, 1.

THOMOMYS FUSCUS LORINGI Bailey.

Alberta Pocket Gopher.

(Pl. VIII, fig. 9.)

Thomomys fuscus loringi Bailey, Proc. Biol. Soc. Washington, XXVII, 118, July 10, 1914.

Type.—Collected at South Edmonton, Alberta (exact locality not given), by J. Alden Loring, September 23, 1894. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Known only from Edmonton and Moose Mountain, Alberta (fig. 5).

Characters.—Similar to *fuscus*, but slightly larger and duller colored, with relatively heavier dentition, and small, circular interparietal; ears small and pointed.

Color.—*Winter pelage* (September 23): Upperparts dull russet-brown, becoming rich buff on sides; nose slaty gray; small ear patch black; underparts rich buffy over plumbeous; chin and small spot on breast white; feet soiled whitish; tail pale buffy. *Summer pelage* (in two July 2 specimens from Moose Mountains): Similar but slightly brighter russet.

Skull.—Long and slender, with narrow brainease and small, nearly quadrate zygomatic arches, and almost circular interparietal; incisors less abruptly decurved than in *fuscus*; molars heavier; bullæ about the same; basioccipital somewhat triangular; nasals narrow and truncate at posterior tips.

Measurements.—Type (♂ ad.): Total length, 199; tail vertebræ, 47; hind foot, 26.5. *Skull* (of type): Basal length, 34; nasals, 12.8; zygomatic breadth, 20.5; mastoid breadth, 18; interorbital breadth, 6; alveolar length of upper molar series, 8.

Remarks.—Although represented by only one specimen from the type locality, which is well out on the plains, this is evidently a form of the mountain species *fuscus* from farther south and west. Two skins in the Victoria Memorial Museum from Moose Mountain are apparently the same, while specimens from St. Marys Lake, Glacier Park, Mont., show a slight tendency toward the characters represented by this form, but are much nearer typical *fuscus*. Specimens from Shuswap, British Columbia, much farther west, show none of the characters of this form. There are no specimens of gophers available from the mountains of western Alberta, between Moose Mountain and the Montana line, but in this strip of country no collections have been made, and probably gophers occur along the eastern slope of the mountains from the United States boundary north to the Edmonton region.

Loring collected specimens of *talpoides* about Edmonton, but these large, dark-colored, large-footed gophers are quite distinct from the

present little brown form. There were no notes to indicate whether the two species occupy the same or separate areas.

In the type specimen the upper molars are abnormally close together at the anterior base, but this is probably not characteristic of the species. Unfortunately there are no skulls for the Moose Mountain specimens, but the skins match the type in color. They are both breeding females collected July 2 by W. Spreadborough and are particularly interesting in showing fully developed sets of 12 mammæ each; inguinal 2–2, abdominal 2–2, pectoral 2–2. This is the formula for the *talpoides* and not for the *fuscus* group. The status of the form is at present very uncertain and will be until more collecting is done in the type region.

Specimens examined.—Total number, 3, as follows:

Alberta: South Edmonton, 1; Moose Mountain, 2 (skins only).

THOMOMYS FUSCUS MYOPS Merriam

Little-Headed Pocket Gopher.

(Pl. VIII, fig. 15.)

Thomomys myops Merriam, Proc. Biol. Soc. Washington, XIV, 112, July 19, 1901.

Type.—Collected at Conconully, Okanogan County, Washington, by J. Alden Loring, September 11, 1897. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Known only from type locality (fig. 5).

Characters.—Size smaller than *fuscus* but with very similar coloration and the same minute ears; skull small; tips of premaxillæ even with posterior tips of nasals.

Color.—September pelage: Upperparts light brownish or dull walnut-brown; ear patch blackish; nose plumbeous; underparts and base of tail buffy; feet and tip of tail whitish; chin usually white. *Young,* paler, more grayish.

Skull.—Small, but of about the form and proportions of that of *fuscus;* nasals and premaxillæ terminating posteriorly on an approximately even line; interparietal transversely elongated; bullæ small; anterior shaft of basioccipital relatively wide; pterygoids wide apart, with edges flattened at base.

Measurements.—Average of 2 topotypes (♂ ad.): Total length, 182; tail vertebræ, 57; hind foot, 25. Average of 5 females: 186, 59, 24.4. *Skull* (of type, ♀ ad.): Basal length, 31.8; nasals, 12.5; zygomatic breadth, 20; mastoid breadth, 17.5; alveolar length of upper molar series, 7.5.

Remarks.—Specimens from the type locality, Conconully, on Conconully Creek, a western affluent of the Okanogan River, are very uniform in characters and so peculiar that they were originally described with full specific rank. They evidently belong to the *fuscus* group,

however, which shows great variation in that general region, and probably mark only a local valley form partly cut off from the general range of the species.

Specimens examined.—Seven, from type locality.

THOMOMYS HESPERUS Merriam.

West Coast Pocket Gopher.

(Pl. VIII, fig. 10.)

Thomomys hesperus Merriam, Proc. Biol. Soc. Washington, XIV, 116, July 19, 1901.

Type.—Collected at Tillamook, Tillamook County, Oregon, by J. Ellis McLellan, November 9, 1894. Type specimen in U. S. Nat. Mus., Biological Survey collection.

Distribution.—Coast region of northwestern Oregon (fig. 5).

Characters.—Size very small, with the small, pointed ears of the *fuscus* group; color dark rich auburn; skull small, short, and rounded.

Color.—Upperparts bright rich auburn, brighter than in *helleri* or *melanops*, darker and richer than in *mazama;* nose and cheeks dusky; large ear patch black; underparts lighter, more ochraceous; lining of cheek pouches white; feet and tip of tail whitish.

Skull.—Short; braincase rather wide; rostrum short and wide; posterior tip of nasals emarginate; bullæ very small, short, and rounded; basioccipital short and wide; pterygoids low and wide apart; molars very small but apparently of about the same proportions as those of *fuscus*.

Measurements.—Type (♀ ad.): Total length, 175; tail vertebræ, 54; hind foot, 24. Old male from Chintimini Mountains: 210, 60, 27. *Skull* (of type): Basal length, 27.3; nasals, 10.7; zygomatic breadth, 18; mastoid breadth, 15; interorbital breadth, 6; alveolar length of upper molar series, 6. Skull of old male from Chintimini Mountains: 30, 12.4, 20, 16.5, 6, 7.

Remarks.—This is evidently a little, dark form of the *fuscus* group, which seems to be isolated below the mouth of the Columbia River. In color it strongly resembles *melanops* of the Olympic Mountains and *helleri* from farther south, but the tiny ears and general skull characters seem to place it in the *fuscus* group. Until a good series of specimens of adult males is obtained its true position can not be fully determined. An old male from the top of Chintimini Mountains (near Corvallis) seems to be the same, but may not be wholly typical.

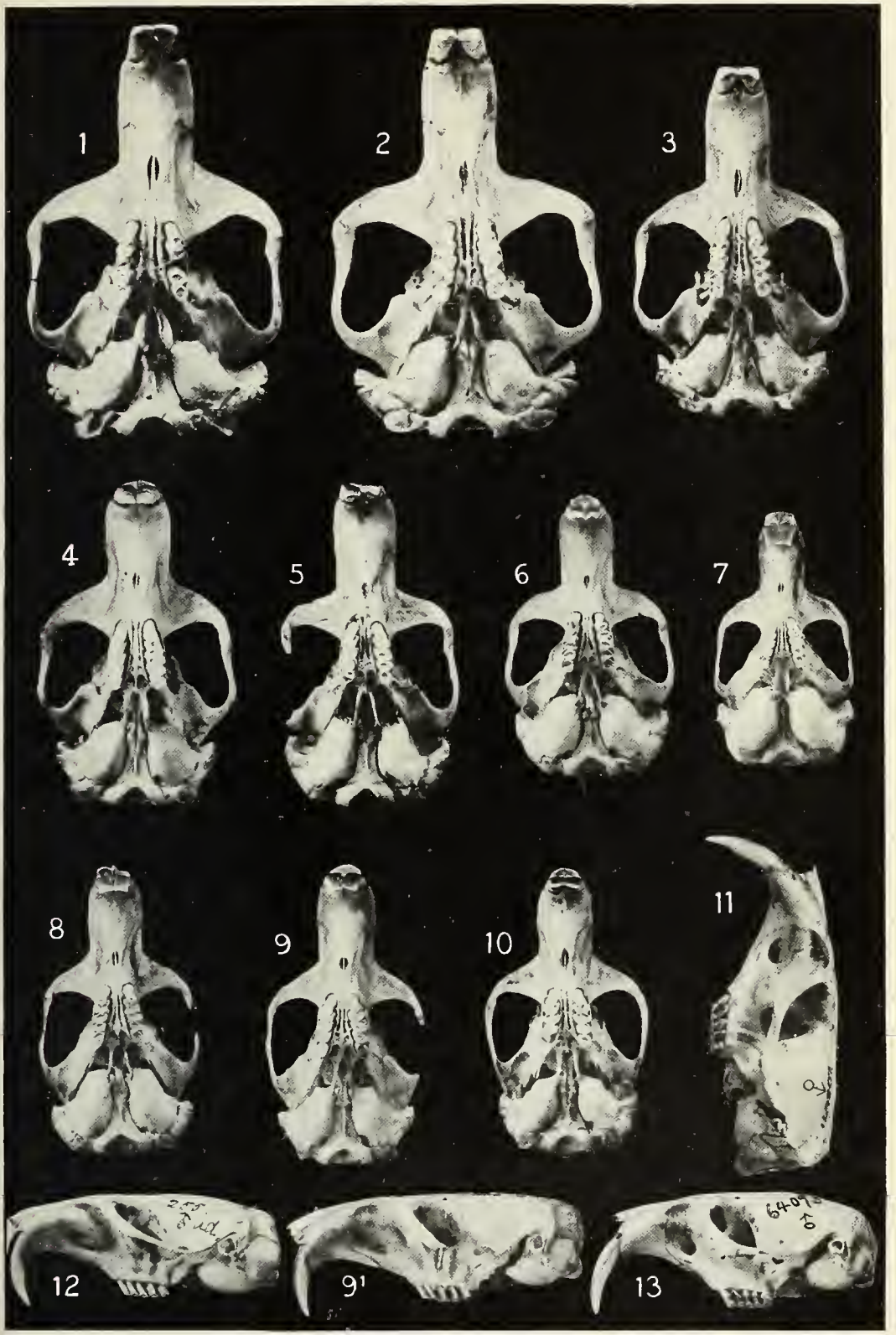
Specimens examined.—Total number, 6, as follows:

Oregon: Chintimini Mountains (at 4,000 feet altitude), 1 old male; Tillamook, 5 (no adult males).

Plate II.

[Natural size; all from U. S. Nat. Mus., Biological Survey collection.]

Fig. 1. *Thomomys bulbivorus*, ♂, Beaverton, Oreg. (No. 57337.)
2. *Thomomys townsendi townsendi*, ♂, Nampa, Idaho. (No. 181196.)
3. *Thomomys bottæ bottæ*, ♂, Point Reyes, Cal. (No. 134989.)
4. *Thomomys perpallidus aureus*, ♂, topotype, Bluff, Utah. (No. 57166.)
5. *Thomomys talpoides rufescens*, ♂, near Ft. Clark, N. Dak. (No. 161381.)
6. *Thomomys talpoides clusius*, ♂, topotype. Bridger Pass, Wyo. (No. 25534.)
7. *Thomomys idahoensis*, ♂, type, Birch Creek, Idaho. (No. 30900.)
8. *Thomomys fossor*, ♂, Lake City, Colo. (No. 48190.)
9. *Thomomys monticola monticola*, ♂, topotype, Tallac, Cal. (No. 100660.) Dorsal and lateral view.
10. *Thomomys douglasi douglasi*, ♂, topotype, Vancouver, Wash. (No. 65928.)
11. *Thomomys bottæ leucodon*, ♂, Ashland, Oreg. (No. 203671.) Lateral view.
12. *Thomomys ocius*, ♂, type, Fort Bridger, Wyo. (No. 25586.)
13. *Thomomys umbrinus umbrinus*, ♂, Boca del Monte, Vera Cruz. (No. 64093.)



B2035-122

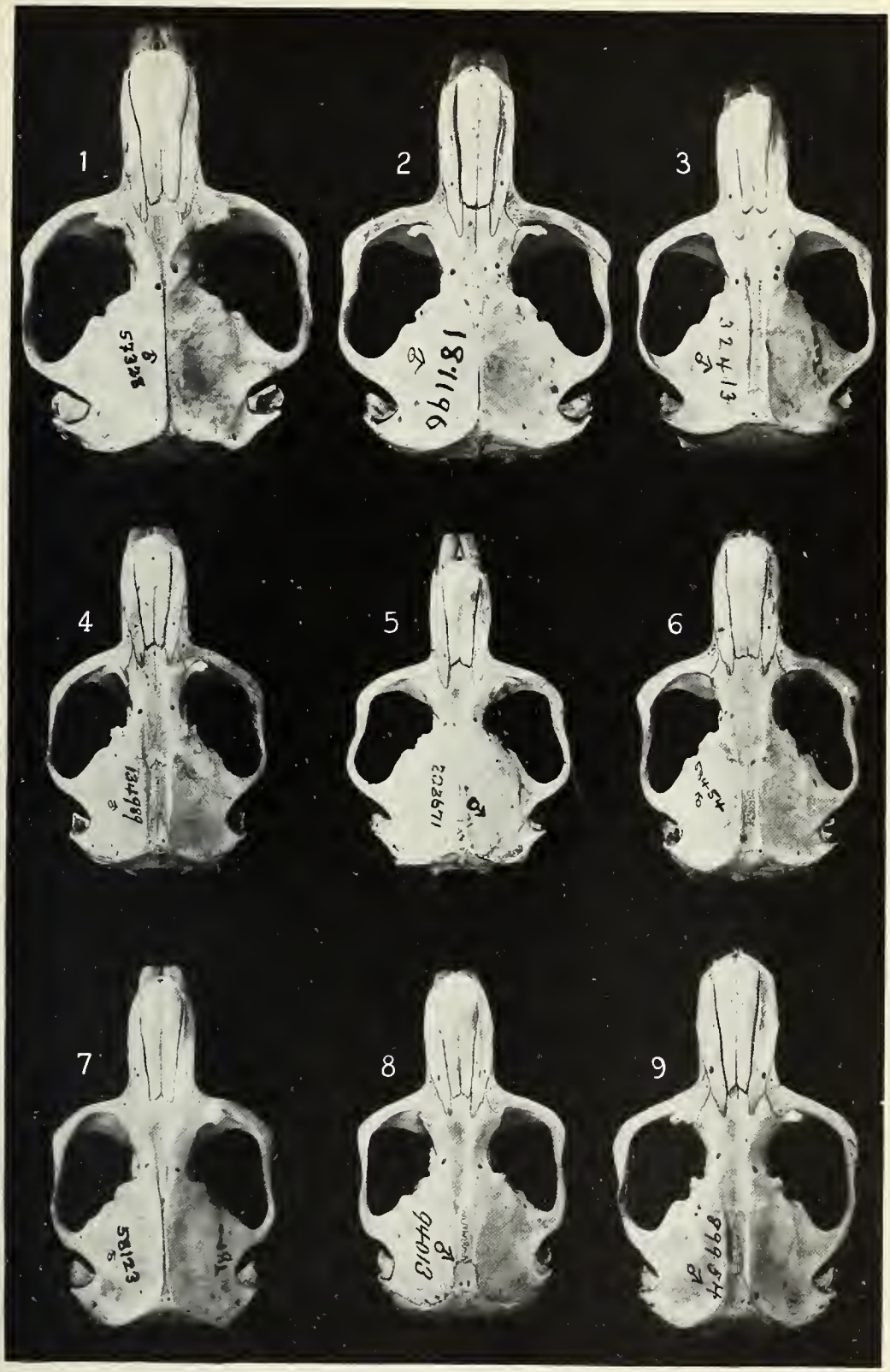
SKULLS OF THOMOMYS.

1. T. bulbivorus.
2. T. t. townsendi.
3. T. b. bottæ.
4. T. p. aureus.
5. T. t. rufescens.
6. T. t. clusius.
7. T. idahoensis.
8. T. fossor.
9 and 9¹. T. m. monticola.
10. T. d. douglasi.
11. T. b. leucodon.
12. T. ocius.
13. T. u. umbrinus.

Plate III.

[Natural size; all from U. S. Nat. Mus., Biological Survey collection.]

Fig. 1. *Thomomys bulbivorus*, ♂, Salem, Oreg. (No. 57328.)
2. *Thomomys townsendi townsendi*, ♂, type, Nampa, Idaho. (No. 181196.)
3. *Thomomys townsendi nevadensis*, ♂, type, Austin, Nev. (No. 32413.)
4. *Thomomys bottæ bottæ*, ♂, Point Reyes, Cal. (No. 134989.)
5. *Thomomys bottæ leucodon*, ♂, Ashland, Oreg. (No. 203671.)
6. *Thomomys bottæ laticeps*, ♂, topotype, Arcata, Cal. (No. 58454.)
7. *Thomomys bottæ angularis*, ♂, type, Los Banos, Cal. (No. 58123.)
8. *Thomomys bottæ pallescens*, ♂, topotype, Grapeland, Cal. (No. 94013.)
9. *Thomomys altivallis*, ♂, topotype, San Bernardino Mountains, Cal. (No. 89954.)



B2036–122

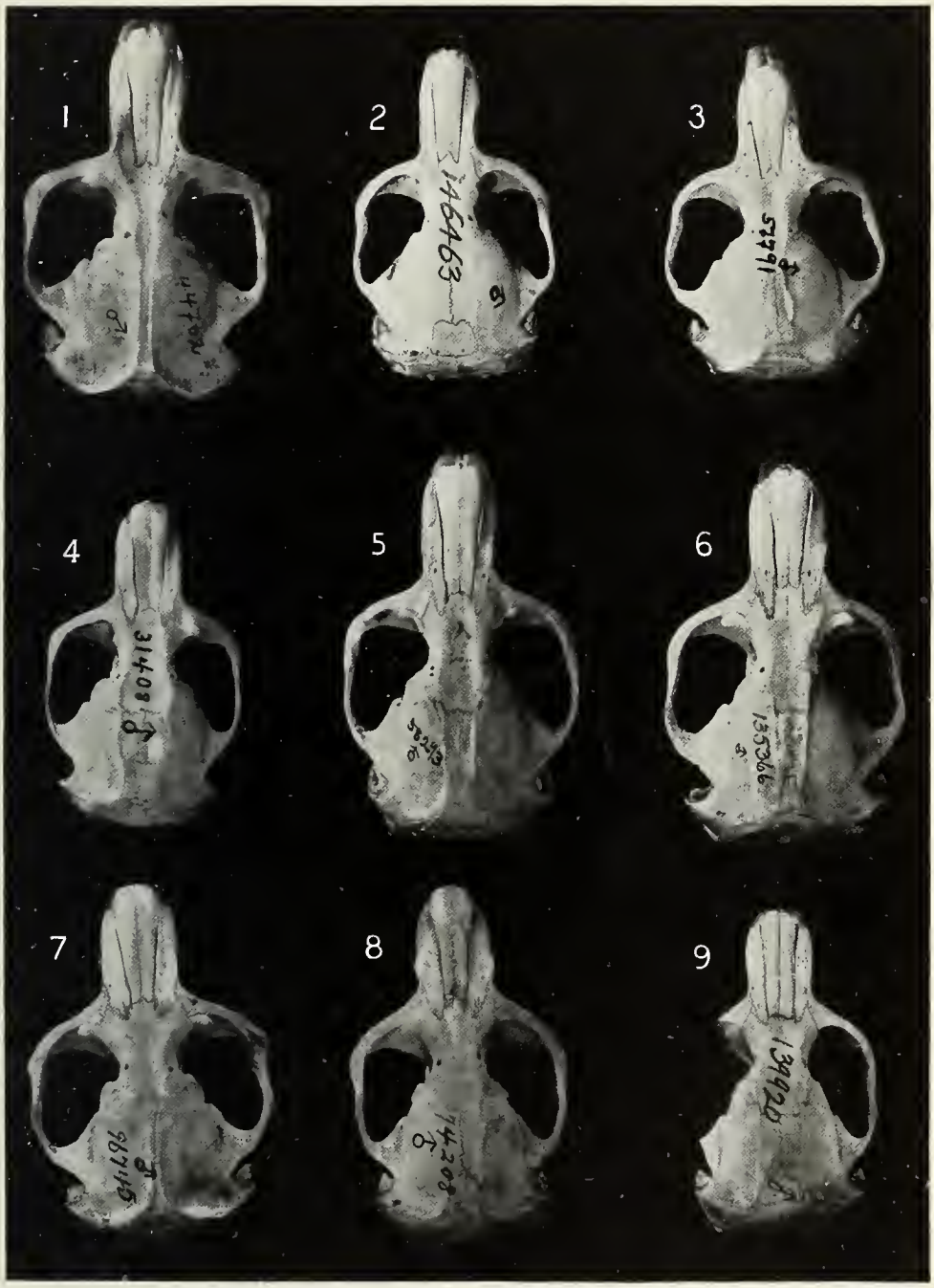
SKULLS OF THOMOMYS.

1. T. bulbivorus.
2. T. t. townsendi.
3. T. t. nevadensis.
4. T. b. bottæ.
5. T. b. leucodon.
6. T. b. laticeps.
7. T. b. angularis.
8. T. b. pallescens.
9. T. altivallis.

Plate IV.

[Natural size; all from U. S. Nat. Mus., Biological Survey collection.]

Fig. 1. *Thomomys bottæ pascalis*, ♂, type, Fresno, Cal. (No. 44702.)
2. *Thomomys bottæ minor*, ♂, type, Fort Bragg, Cal. (No. 146463.)
3. *Thomomys bottæ navus*, ♂, type, Red Bluff, Cal. (No. 57791.)
4. *Thomomys fulvus texensis*, ♂, type, Davis Mountains, Tex. (No. 31408.)
5. *Thomomys fulvus pervagus*, ♂, type, Espanola, N. Mex. (No. 58293.)
6. *Thomomys perpallidus apache*, ♂, type, La Jara Lake, N. Mex. (No. 135366.)
7. *Thomomys sinaloæ*, ♂, type, Altata, Sinaloa. (No. 96745.)
8. *Thomomys bottæ alticolus*, ♂, topotype, Victoria Mountains, Lower California. (No. 74208.)
9. *Thomomys bottæ russeolus*, ♂, type, San Angel, Lower California. (No. 139920.)



B2037-122

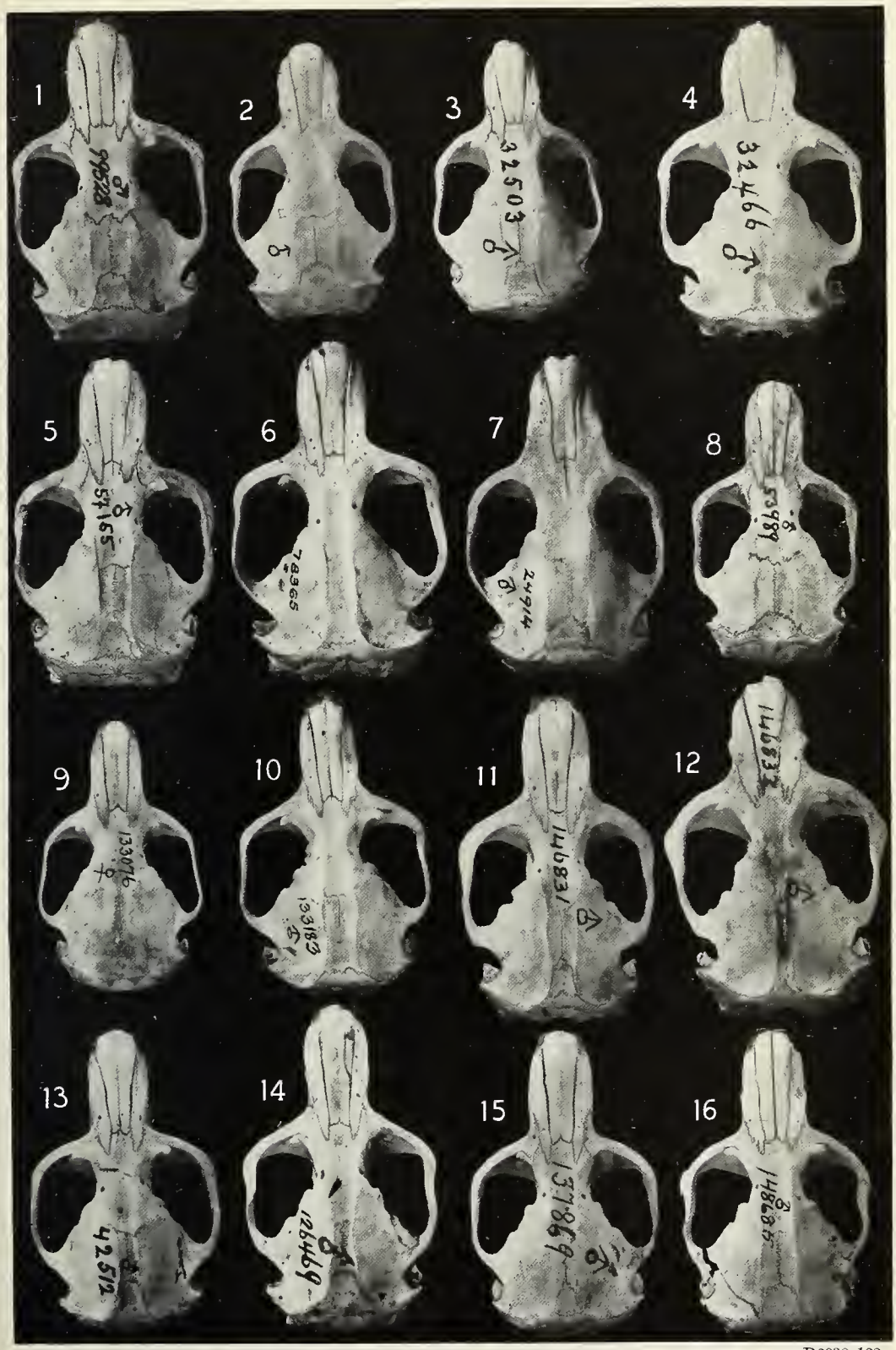
SKULLS OF THOMOMYS.

1. T. b. pascalis.
2. T. b. minor.
3. T. b. navus.
4. T. f. texensis.
5. T. f. pervagus.
6. T. p. apache.
7. T. sinaloæ.
8. T. b. alticolus.
9. T. b. russeolus.

Plate V.

[Natural size; all from U. S. Nat. Mus., Biological Survey collection, except fig. 2.]

Fig. 1. *Thomomys perpallidus albatus*, ♂, topotype, Fort Yuma, Cal. (No. 99528.)
2. *Thomomys perpallidus perpallidus*, ♂, topotype, Palm Springs, Cal. (No. 4, collection of Dr. William Bebb.)
3. *Thomomys perpallidus perpes*, ♂, type, Lone Pine, Cal. (No. 32503.)
4. *Thomomys operarius*, ♂, type, Keeler, Cal. (No. 32466.)
5. *Thomomys perpallidus aureus*, ♂, topotype, Bluff, Utah. (No. 57155.)
6. *Thomomys perpallidus canus*, ♂, type, Deep Hole, Nev. (No. 78365.)
7. *Thomomys latirostris*, ♂, type, Painted Desert, Ariz. (No. 24914.)
8. *Thomomys cabezonæ*, ♂, type, Cabezon, Cal. (No. 53989.)
9. *Thomomys alpinus awahnee*, ♀, type, Yosemite Valley, Cal. (No. 133076.)
10. *Thomomys bottæ mewa*, ♂, type, Raymond, Cal. (No. 133183.)
11. *Thomomys bottæ anitæ*, ♂, topotype, Santa Anita, Lower California. (No. 146831.)
12. *Thomomys magdalenæ*, ♂, type, Magdalena Island, Lower California. (No. 146832.)
13. *Thomomys alpinus alpinus*, ♂, type, Mount Whitney, Cal. (No. 42512.)
14. *Thomomys jacinteus*, ♂, San Jacinto Mountains (Tahquitz Valley), Cal. (No. 126469.)
15. *Thomomys neglectus*, ♂, type, San Antonio Mountains, Cal. (No. 137869.)
16. *Thomomys bottæ nigricans*, ♂, topotype, Witch Creek, Cal. (No. 148685.)



B2038-122

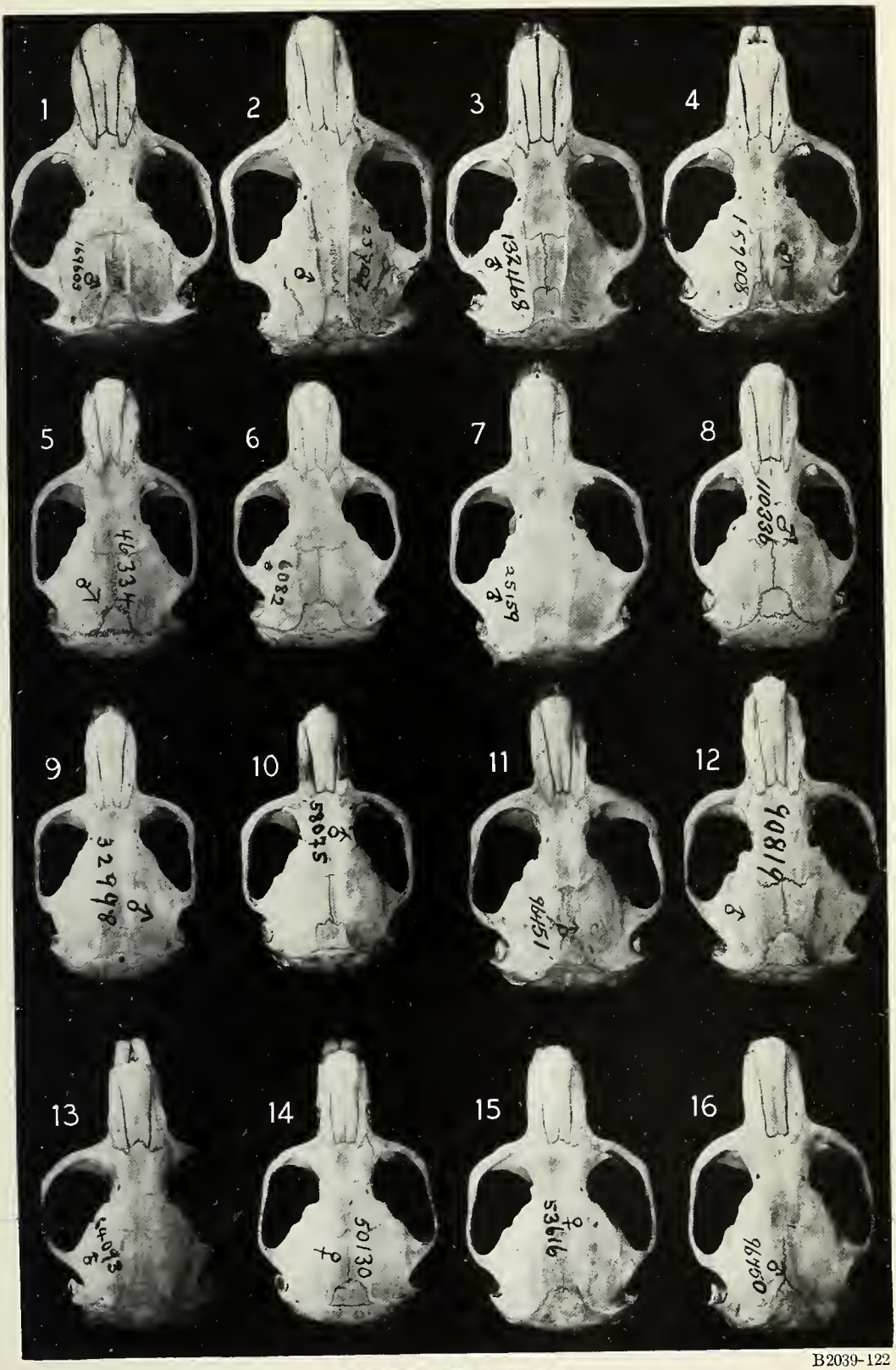
SKULLS OF THOMOMYS.

1. T. p. albatus.
2. T. p. perpallidus.
3. T. p. perpes.
4. T. p. operarius.
5. T. p. aureus.
6. T. p. canus.
7. T. latirostris.
8. T. cabezonæ.
9. T. a. awahnee.
10. T. b. mewa.
11. T. b. anitæ.
12. T. magdalenæ.
13. T. a. alpinus.
14. T. jacinteus.
15. T. neglectus.
16. T. b. nigricans.

Plate VI.

[Natural size; all from U. S. Nat. Mus., Biological Survey collection.]

Fig. 1. *Thomomys fulvus fulvus*, ♂, Flagstaff, Ariz. (No. 169603.)
2. *Thomomys cervinus*, ♂, topotype, Phoenix, Ariz. (No. 23707.)
3. *Thomomys fulvus toltecus*, ♂, typical, Colonia Diaz, Chihuahua. (No. 132468.)
4. *Thomomys mearnsi*, ♂, type, Animas Valley, N. Mex. (No. 157008.)
5. *Thomomys fulvus intermedius*, ♂, Fort Huachuca, Ariz. (No. 46334.)
6. *Thomomys fulvus desertorum*, ♂, type, Mud Spring, Ariz. (No. 6082.)
7. *Thomomys baileyi*, ♂, type, Sierra Blanca, Tex. (No. 25159.)
8. *Thomomys lachuguilla*, ♂, type, El Paso, Tex. (No. 110336.)
9. *Thomomys perditus*, ♂, type, Lampazos, Nuevo Leon. (No. 32998.)
10. *Thomomys goldmani*, ♂, type, Mapimi, Durango. (No. 58075.)
11. *Thomomys nelsoni*, ♂, type, Parral, Chihuahua. (No. 96451.)
12. *Thomomys sheldoni*, ♂, type, Santa Teresa, Tepic. (No. 90819.)
13. *Thomomys umbrinus umbrinus*, ♂, Boca Del Monte, Vera Cruz. (No. 64093.)
14. *Thomomys umbrinus peregrinus*, ♀, type, Salazar, Mexico. (No. 50130.)
15. *Thomomys umbrinus orizabæ*, ♀, type, Mount Orizaba, Puebla. (No. 53616.)
16. *Thomomys atrovarius*, ♂, typical, Mazatlan, Sinaloa. (No. 96750.)



B2039-122

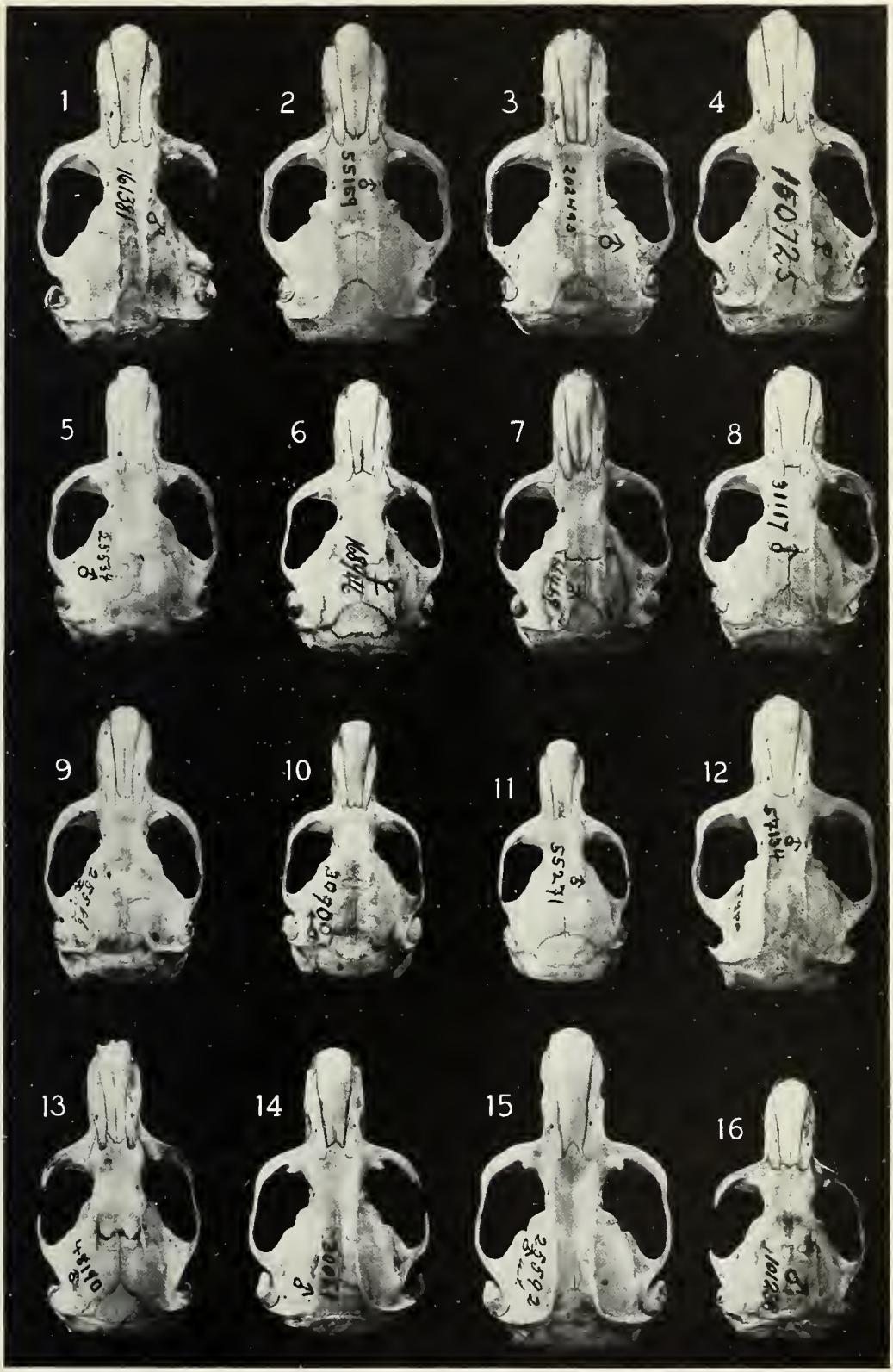
SKULLS OF THOMOMYS.

1. T. f. fulvus.
2. T. cervinus.
3. T. f. toltecus.
4. T. mearnsi.
5. T. f. intermedius.
6. T. f. desertorum.
7. T. baileyi.
8. T. lachuguilla.
9. T. perditus.
10. T. goldmani.
11. T. nelsoni.
12. T. sheldoni.
13. T. u. umbrinus.
14. T. u. peregrinus.
15. T. u. orizabæ.
16. T. atrovarius.

Plate VII.

[Natural size; all from U. S. Nat. Mus., Biological Survey collection.]

Fig. 1. *Thomomys talpoides rufescens*, ♂, near Fort Clark, N. Dak. (No. 161381.)
2. *Thomomys talpoides bullatus*, ♂, type, Powderville, Mont. (No. 55159.)
3. *Thomomys talpoides nebulosus*, ♂, type, Sand Creek Canyon, Wyo. (No. 202495.)
4. *Thomomys talpoides agrestis*, ♀, type, Medano Ranch, Colo. (No. 150725.)
5. *Thomomys talpoides clusius*, ♂, topotype, Bridgers Pass, Wyo. (No. 25534.)
6. *Thomomys talpoides caryi*, ♀, type, Bighorn Mountains, Wyo. (No. 168946.)
7. *Thomomys talpoides pryori*, ♂, type, Pryor Mountains, Mont. (No. 66469.)
8. *Thomomys quadratus quadratus*, ♂, type, The Dalles, Oreg. (No. 31117.)
9. *Thomomys ocius*, ♂, type, Fort Bridger, Wyo. (No. 25586.)
10. *Thomomys idahoensis*, ♂, type, Birch Creek, Idaho. (No. 30900.)
11. *Thomomys pygmæus*, ♂, type, Montpelier Creek, Idaho. (No. 55271.)
12. *Thomomys columbianus*, ♂, type, Touchet, Wash. (No. 57134.)
13. *Thomomys fossor*, ♂, Lake City, Colo. (No. 48190.)
14. *Thomomys uinta*, ♂, type, Uinta Mountains, Utah. (No. 30051.)
15. *Thomomys bridgeri*, ♂, type, Fort Bridger, Wyo. (No. 25592.)
16. *Thomomys quadratus fisheri*, ♂, type, Sierra Valley, Cal. (No. 101238.)



B2040-122

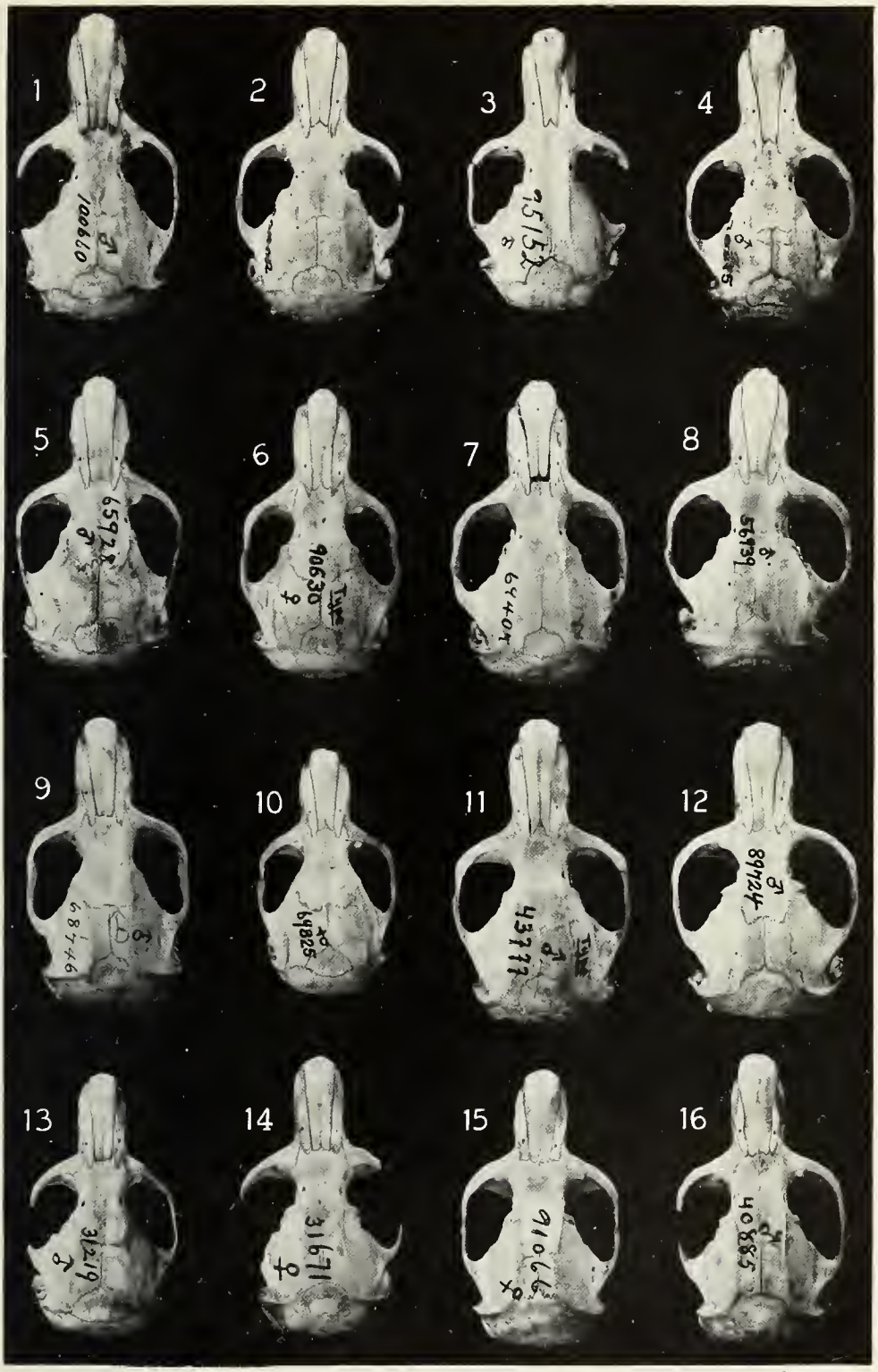
SKULLS OF THOMOMYS.

1. T. t. rufescens.
2. T. t. bullatus.
3. T. t. nebulosus.
4. T. t. agrestis.
5. T. t. clusius.
6. T. t. caryi.
7. T. t. pryori.
8. T. q. quadratus.
9. T. ocius.
10. T. idahoensis.
11. T. pygmæus.
12. T. columbianus.
13. T. fossor.
15. T. uinta.
15. T. bridgeri.
16. T. q. fisheri.

Plate VIII.

[Natural size; all from U. S. Nat. Mus., Biological Survey collection.]

Fig. 1. *Thomomys monticola monticola*, ♂, topotype, Tallac, Cal. (No. 100660.)
2. *Thomomys monticola mazama*, ♂, type, Anna Creek, Oreg. (No. 80502.)
3. *Thomomys monticola pinetorum*, ♂, type, Sisson, Cal. (No. 95152.)
4. *Thomomys monticola nasicus*, ♂, type, Farewell Bend, Deschutes River, Oreg. (No. 79815.)
5. *Thomomys douglasi douglasi*, ♂, topotype, Vancouver, Wash. (No. 65928.)
6. *Thomomys douglasi melanops*, ♀, type, Olympic Mountains, Wash. (No. 90630.)
7. *Thomomys niger*, ♂, type, Seaton, Oreg. (No. 69407.)
8. *Thomomys douglasi oregonus*, ♂, type, Oregon City, Oreg. (No. 56939.)
9. *Thomomys fuscus loringi*, ♂, type, Edmonton, Alberta. (No. 68746.)
10. *Thomomys hesperus*, immature ♀, type, Tillamook, Oreg. (No. 69825.)
11. *Thomomys douglasi yelmensis*, ♂, type, Tenino, Wash. (No. 43777.)
12. *Thomomys limosus*, ♂, type, White Salmon, Wash. (No. 89724.)
13. *Thomomys fuscus fuscus*, ♂, Lemhi, Idaho. (No. 31219.)
14. *Thomomys fuscus fuscus*, ♀, type, head of Big Lost River, Idaho. (No. 31671.)
15. *Thomomys fuscus myops*, ♀, type, Conconully, Wash. (No. 91066.)
16. *Thomomys fuscus saturatus*, ♂, type, Silver, Mont. (No. 40885.)



B2041-122

SKULLS OF THOMOMYS.

1. T. m. monticola.
2. T. m. mazama.
3. T. m. pinetorum.
4. T. m. nasicus.
5. T. d. douglasi.
6. T. d. melanops.
7. T. niger.
8. T. d. oregonus.
9. T. f. loringi.
10. T. hesperus.
11. T. d. yelmensis.
12. T. limosus.
13. T. f. fuscus, ♂.
14. T. f. fuscus, ♀.
15. T. f. myops.
16. T. f. saturatus.

INDEX.

[New names in **bold-face type**; synonyms in *italics*.]

A.

Abnormal pelage conditions, 20.
Acknowledgments, 31.
agrestis, Thomomys talpoides, 105–106.
albatus, Thomomys perpallidus, 70.
Albinism, 20.
alpinus, Thomomys alpinus, 63–64.
alticolus, Thomomys bottæ, 60.
altivallis, Thomomys, 62–63.
angularis, Thomomys bottæ, 53.
anitæ, Thomomys bottæ, 59.
apache, Thomomys perpallidus, 75–76.
aphrastus, Thomomys, 56.
Ascomys borealis, 97.
bulbivorus, 40.
talpoides, 97.
atrogriseus, Thomomys nevadensis, 42.
atrovarius, Thomomys, 95–96.
aureus, Thomomys perpallidus, 74–75.
awahnee, Thomomys alpinus, 64–65.

B.

baileyi, Thomomys, 87–88.
borealis, Ascomys, 97.
Geomys, 96, 100.
Pseudostoma, 100.
Saccophorus, 97.
bottæ, Oryctomys (*Saccophorus*), 45.
Thomomys bottæ, 45–46.
Breeding habits, 11.
bridgeri, Thomomys, 112–113.
bulbivorum, Diplostoma, 40, 45.
Pseudostoma, 40.
bulbivorus, Ascomys, 40.
Geomys, 40.
Thomomys, 40–42.
Thomomys, 45.
bullatus, Thomomys talpoides, 101–102.
Burrows, 8.

C.

cabezonæ, Thomomys, 76–77.
Camas rat, 40–42.
canus, Thomomys perpallidus, 73–74.
caryi, Thomomys talpoides, 103–104.
cervinus, Thomomys, 79.
Characters, cranial, 16.
general, 14.
generic, 32.
chrysonotus, Thomomys perpallidus, 71.
clusius, Thomomys talpoides, 100–101.
columbianus, Thomomys, 106–107.
Cranial characters, 16.
Cratogeomys, 7.
Cricetus talpoides, 96.

D.

Damage by pocket gophers, 10.
Dentition, 17.
desertorum, Thomomys fulvus, 83–84.
Destruction of pocket gophers, 14.
diaboli, Thomomys bottæ, 51–52.
Diplostoma bulbivorum, 40, 45.
Disposition of pocket gophers, 13.
Distribution of pocket gophers, 7, 22.
douglasi, Thomomys douglasi, 116–117.
douglasii, Geomys, 116.
Thomomys, 116.

E.

Enemies of pocket gophers, 13.

F.

fisheri, Thomomys quadratus, 115–116.
Food of pocket gophers, 10.
pocket gophers as, 13.
fossor, Thomomys, 111–112.
fuliginosus, Geomys, 116.
fulvus, Geomys, 80.
Thomomys fulvus, 80–82.
fuscus, Thomomys fuscus, 126–128.

G.

General characters, 14.
Generic characters, 32.
Geomys, 7.
borealis, 96, 100.
bulbivorus, 40.
bursarius, 100.
douglasii, 116.
fuliginosus, 116.
fulvus, 80.
oregonensis, 100.
talpoides, 96.
(*Thomomys*) *talpoides*, 97.
townsendii, 42, 43.
umbrinus, 89.
unisulcatus, 97.
goldmani, Thomomys, 94–95.
Gopher. *See* Pocket gopher.
Group relationships, 32.

H.

Habits, breeding, 11.
food, 10.
general, 8.
winter, 11.
Heavy rostrum groups, 32.
helleri, Thomomys monticola, 126.
hesperus, Thomomys, 131.
Heterogeomys, 7.

I.

idahoensis, Thomomys, 108–109.
infrapallidus, Thomomys bottæ, 55–56.
intermedius, Thomomys fulvus, 84–85.

J.

jacinteus, Thomomys, 66–67.

K.

Key to species, 36–40.

L.

lachuguilla, Thomomys, 88–89.
laticeps, Thomomys bottæ, 46–47.
latirostris, Thomomys, 78–79.
leucodon, Thomomys bottæ, 47–49.
limosus, Thomomys, 120–121.
List of species, 34–36.
loringi, Thomomys fuscus, 129–130.

M.

Macrogeomys, 7.
magdalenæ, Thomomys, 61–62.
Map (genus), 9.
Maps (species) 23, 24, 25, 26, 27, 28.
martirensis, Thomomys, 67–68.
Material examined, 30.
mazama, Thomomys monticola, 123–124.
mearnsi, Thomomys, 87.
Megascapheus (subgenus), 40.
Melanism, 21.
melanops, Thomomys douglasi, 119–120.
mewa, Thomomys bottæ, 50.
minor, Thomomys bottæ, 51.
Molt, 18.
monticola, Thomomys monticola, 121–123.
monticolus, Thomomys, 121.
myops, Thomomys fuscus, 130–131.

N.

nasicus, Thomomys monticola, 125.
Natural enemies of pocket gophers, 13.
navus, Thomomys bottæ, 49–50.
nebulosus, Thomomys talpoides, 102–103.
neglectus, Thomomys, 65–66.
nelsoni, Thomomys, 92–93.
nevadensis, Thomomys townsendi, 44–45.
niger, Thomomys, 121.
nigricans, Thomomys bottæ, 56–58.

O.

ocius, Thomomys, 107–108.
operarius, Thomomys, 77–78.
oregonus, Thomomys douglasi, 117–118.
orizabæ, Thomomys umbrinus, 90–91.
Orthogeomys, 7.
Oryctomys (*Saccophorus*) *bottæ*, 45.

P.

pallescens, Thomomys bottæ, 55.
Pappogeomys, 7.
pascalis, Thomomys bottæ, 54.
Pelage, 15.
conditions, abnormal, 20.
perditus, Thomomys, 95.
peregrinus, Thomomys umbrinus, 91–92.
perpallidus, Thomomys perpallidus, 68–69.
perpes, Thomomys perpallidus, 72–73.
pervagus, Thomomys fulvus, 82–83.
pinetorum, Thomomys monticola, 124–125.
Platygeomys, 7.
Pocket gopher. *See also* Thomomys.
Alberta, 129–130.
Bighorn, 103–104.
black, 121.
black-and-brown, 95–96.
black-headed, 119–120.
Black Hills, 102–103.
brown, 126–128.
Cabezon, 76–77.
California, 45–46.
California Mountain, 121–123.
camas, 40–42.
Cape San Lucas, 59.
Carrizo Plain, 55–56.
Cœur d'Alene, 128.
Colorado, 111–112.
Columbia, 106–107.
Coues, 100–101.
Dakota, 98–99.
Dalles, 114–115.
Davis Mountain, 85.
Deschutes, 125.
desert, 83–84.
Diablo, 51–52.
digger pine, 50.
Douglas, 116–117.
Espanola, 82–83.
fawn-colored, 79.
Fisher, 115–116.
Fort Bridger, 112–113.
Fresno, 54.
fulvous, 80–82.
Goldman, 94–95.
Grapeland, 55.
gray, 73–74.
Green River, 107–108.
Heller, 126.
Humboldt Bay, 46–47.
Idaho, 108–109.
Jicarilla, 75–76.
Lachuguilla, 88–89.
La Puerta, 58–59.
little gray, 95.
little-headed, 130–131.
Lone Pine, 72–73.
Los Banos, 53.
Magdalena, 61–62.
Mazama, 123–124.
Mearns, 87.
Mendocino, 51.
Mexican, 91–92.
mountain-top, 84–85.
Mount Whitney, 63–64.
Nelson, 92–93.
Nevada, 44–45.
Oregon, 117–118.
Orizaba, 90–91.
Owens Lake, 77–78.
Painted Desert, 78–79.
Palm Springs, 68–69.
Phœnix, 79.
prairie, 98–99.
Pryor Mountain, 104–105.
pygmy, 109–110.
red, 49–50.

Pocket gopher, sage, 101–102.
San Angel, 60–61.
San Bernardino Mountain, 62–63.
San Gabriel, 65–66.
San Jacinto, 66–67.
San Luis, 105–106.
San Pedro Martir, 67–68.
Saskatchewan, 96–98.
Sheldon, 93–94.
Sierra Blanca, 87–88.
Sierra Laguna, 60.
Sinaloa, 80.
Southern, 89–90.
Stephens, 56–58.
Toltec, 86.
Townsend, 42–43.
Uinta, 113–114.
West Coast, 131.
white, 70.
White Salmon, 120–121.
white-toothed, 47–49.
yellow, 74–75.
yellow-backed, 71.
yellow pine, 124–125.
Yelm, 118–119.
Yosemite, 64–65.
Pockets, 15.
premarillaris, Thomomys monticola, 124.
pryori, Thomomys talpoides, 104–105.
Pseudostoma borealis, 100.
bulbivorum, 40.
talpoides, 97.
puertæ, Thomomys bottæ, 58–59.
pygmæus, Thomomys, 109–110.

Q.

quadratus, Thomomys quadratus, 114–115.

R.

rufescens, Thomomys, 98–99.
russeolus, Thomomys bottæ, 60–61.

S.

Saccophorus (subgenus), 45.
borealis, 97.
bottæ, 45.
talpoides, 96.
Sand rat, Columbia, 116–117.
saturatus, Thomomys fuscus, 128.
scapterus, Thomomys, 72.
Sexual variation, 17.
sheldoni, Thomomys, 93–94.
sinaloæ, Thomomys, 80.
Slender rostrum groups, 33.
Species, list, 34–36.
maps, 23, 24, 25, 26, 27, 28.

T.

talpoides, Ascomys, 97.
Cricetus, 96.
Geomys, 96, 97.
Pseudostoma, 97.
Saccophorus, 96.
Thomomys talpoides, 96–98.
texensis, Thomomys fulvus, 85.
Thomomys, 32. *See also* Pocket gopher.
agrestis, 105–106.
Thomomys albatus, 70.
alpinus, 63–64.
alticolus, 60.
altivallis, 62–63.
angularis, 53.
anitæ, 59.
apache, 75–76.
aphrastus, 56.
atrogriseus, 42.
atrovarius, 95–96.
aureus, 74–75.
awahnee, 64–65.
baileyi, 87–88.
bottæ, 45–46.
bridgeri, 112–113.
bulbivorus, 40–42.
bulbivorus, 45.
bullatus, 101–102.
cabezonæ, 76–77.
canus, 73–74.
caryi, 103–104.
cervinus, 79.
chrysonotus, 71.
clusius, 100–101.
columbianus, 106–107.
desertorum, 83–84.
diaboli, 51–52.
douglasi, 116–117.
fisheri, 115–116.
fossor, 111–112.
fulvus, 80–82.
fuscus, 126–128.
goldmani, 94–95.
helleri, 126.
hesperus, 131.
idahoensis, 108–109.
infrapallidus, 55–56.
intermedius, 84–85.
jacinteus, 66–67.
lachuguilla, 88–89.
laticeps, 46–47.
latirostris, 78–79.
leucodon, 47–49.
limosus, 120–121.
loringi, 129–130.
magdalenæ, 61–62.
martirensis, 67–68.
mazama, 123–124.
mearnsi, 87.
melanops, 119–120.
mewa, 50.
minor, 51.
monticola, 121–123.
monticolus, 121.
myops, 130–131.
nasicus, 125.
navus, 49–50.
nebulosus, 102–103.
neglectus, 65–66.
nelsoni, 92–93.
nevadensis, 44–45.
niger, 121.
nigricans, 56–58.
ocius, 107–108.
operarius, 77–78.
oregonus, 117–118.
orizabæ, 90–91.

Thomomys pallescens, 55.
pascalis, 54.
perditus, 95.
peregrinus, 91–92.
perpallidus, 68–69.
perpes, 72–73.
pervagus, 82–83.
pinetorum, 124–125.
premaxillaris, 124.
pryori, 104–105.
puertæ, 58–59.
pygmæus, 109–110.
quadratus, 114–115.
rufescens, 98–99.
russeolus, 60–61.
saturatus, 128.
scapterus, 72.
sheldoni, 93–94.
sinaloæ, 80.
talpoides, 96–98.
texensis, 85.
toltecus, 86.
townsendi, 42–43.
uinta, 113–114.
Thomomys umbrinus, 89–90.
yelmensis, 118–119.
tolteeus, Thomomys fulvus, 86.
townsendi, Thomomys townsendi, 42–43
townsendii, *Geomys*, 42, 43.
Type localities, list, 34–36.

U.

uinta, Thomomys, 113–114.
umbrinus, *Geomys*, 89.
Thomomys umbrinus, 89–90.
unisulcatus, *Geomys*, 97.

V.

Variation, 22.
sexnal, 17.

W.

Winter habits, 11.

Y.

yelmensis, Thomomys douglasi, 118–119.

Z.

Zygogeomys, 7.

ADDITIONAL COPIES

OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
25 CENTS PER COPY

FEB 1961